Facilities Planning Branch

National Park Service
U.S. Department of the Interior

Park Facility Management Division

DRAFT

National Long Range Transportation Plan

October 2014

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Cover Photo: Yellowstone National Park | © Neal Herbert

Prologue

National parks have fostered a sense of exploration and adventure since the National Park Service was created in 1916 to protect and preserve America's natural and cultural heritage. Throughout the 20th century, the ideal park experience for many was loading the family into the station wagon and hitting America's back roads and interstates, with families often finding themselves at the edge of the Grand Canyon, at the roaring lower falls of Yellowstone, or at the base of the impressive rock formations of Yosemite. During this era, the automobile made national park experiences accessible to many people. Park units and nearby communities alike rushed to meet the needs of new visitors through the creation of motels, lodges, and campgrounds, as well as many roadside conveniences. The most extreme travel delays came in the form of a herd of buffalo or a bear near enough to the road to draw traffic to a halt and provide a rare, memorable photographic moment.

While many visitors still enjoy these experiences today, the simplicity of traveling to and through a national park unit has become increasingly more complex. The park service has become much more inclusive in its nearly 100 years of operation. The more than 400 park units that comprise the National Park Service today include not only the large western parks for which the agency is well known, but also nationally significant urban parks, historic sites, parkways, battlefields, and a diversity of other park types across the country. The rare and welcome delay of a "bear jam" along a remote park road has been eclipsed by daily commuter delays on NPS urban parkways and along a burgeoning network of regional commuter routes traversing park service lands.

Over the years, the National Park Service has seen increasing visitation and demographic changes as motels have given way to hotels and full campgrounds routinely require reservations months in advance. This visitation has resulted in busy entrance stations and attractions, which are indicators that our national park units are sought after, relevant, and an active part of American culture and landscape. However, it has also led to increasing traffic, crowded parking lots and transportation resource degradation—issues that require thoughtful planning and foresight to effectively navigate.

For nearly a century, the park service has been a leader in connecting people to both the outdoors and our national heritage. Yet the agency faces the challenges of providing a transportation system to efficiently manage visitor use in the context of providing the same types of experiences for the enjoyment of future generations and preserving resources. Today's generation of visitors has different needs and expectations and the agency must adapt to meet these changing demands. While a majority of visitors still reach national park units by private automobile, alternative, multimodal transportation options have become increasingly more viable as possible solutions to better manage congestion and maintain roadways. Many park units are near urban areas, bringing greater opportunity to connect a wide range of people to park units in their own backyards through alternative transportation, trails, and transit—approaches that can also help relieve the burden on NPS roadways.

Modern science and visitor trend analysis have provided new insight into the opportunities and challenges related to transportation in the National Park Service. This information can help the service understand changing visitation patterns, the nexus between resource stewardship and transportation, and the impacts of managing visitors, resources, and infrastructure with the threats of decreasing funding and climate change. Adequate planning can help identify unique solutions to challenges and provide the service with a trajectory that is full of opportunity—for visitors now and for future generations.

Olympic National Park (c) Miguel Vieira

Executive Summary

NPS Transportation System

For nearly a century, the National Park Service has been a leader in connecting people to national treasures that exemplify the country's natural and cultural heritage. The NPS transportation network, which is composed of both motorized and nonmotorized facilities that accommodate surface, marine, and aviation modes, plays a critical role in connecting more than 430 million visitors to these special places each year. Furthermore, the NPS transportation network includes nearly 4,000 historic and culturally significant facilities, which the National Park Service manages to preserve their historic character and integrity and their important transportation functions today.

The National Park Service has succeeded in effectively managing its extensive, diverse transportation facilities in the face of limited funding. The majority of the $38 billion portfolio of transportation assets is currently in good condition. However, the accumulated deferred maintenance backlog of $7.5 billion indicates a continuing and mounting challenge, one that threatens the agency's ability to continue to maintain all facilities at this condition level.

Snapshot of NPS Transportation System

- 5,500 miles of paved roads
- 7,000 miles of unpaved roads
- 6,200 paved parking areas
- 1,400 bridges
- 130 transit systems
- 2,250 miles of trails
- 950 trail bridges
- 1,000 marine systems
- 60 aviation systems
- 30 constructed waterways
- 250 railroad systems
- 12,000 fleet vehicles

National Long Range Transportation Plan

The National Park Service (NPS) National Long Range Transportation Plan (National LRTP) is the comprehensive national vision guiding transportation program priorities and investments servicewide. The current federal surface transportation authorizing legislation Moving Ahead for Progress in the 21st Century Act (MAP-21) (23 USC 201) requires federal land management agencies such as the National Park Service to develop long-range transportation plans that are consistent with the continuous, comprehensive, and cooperative long-range transportation planning processes required of state departments of transportation and metropolitan planning organizations (23 USC §134 and 135). This National LRTP is consistent with those processes and legal requirements.

The NPS National LRTP better aligns transportation planning with all aspects of the NPS mission and recommits the agency to both protecting and providing access to the nation's most important, unique, and special places. The National LRTP sets goals and objectives that address both traditional transportation topics as well as additional mission-focused topics such as visitor experience and natural and cultural resource protection. This plan establishes high-level goals and objectives, investment strategies, and performance measures that will shape future transportation investments across the National Park Service.

VISION FOR TRANSPORTATION IN THE NATIONAL PARK SERVICE

The National Park Service provides a mission-focused transportation system that is safe and seamless, enabling high-quality access to essential park experiences. The agency responsibly plans and effectively manages the transportation system to accommodate changing environmental, social, and financial conditions.

National LRTP Planning Approach

This National LRTP was developed through a servicewide multidisciplinary effort that incorporated the three C's of transportation planning: cooperative, comprehensive, and continuing. The plan is focused on five goal areas: facility management, transportation finance, resource protection, visitor experience, and safety. Within each goal area the plan lays out baseline conditions and trends, provides recommended strategies to achieve the stated objectives, and lists the performance measures and targets that the National Park Service will use to gauge progress toward meeting the goal and objectives.

A wide variety of NPS staff, including more than 80 subject matter experts at the directorate, region, unit, and program level, as well as external stakeholders, including the Federal Highway Administration, provided critical input to each phase of the planning process. This plan, and the extensive collaborations that produced it, lay the foundation for a new era of transportation planning for the National Park Service, one in which transportation decisions are made within a more comprehensive and coordinated context, and with greater involvement of NPS programs and partners.

PHASE 1: completed August 2012

ESTABLISH VISION, GOALS AND OBJECTIVES: The planning team, with input from a variety of NPS staff, established a 20 year vision for the NPS transportation system and developed associated goals and objectives. The vision, goals, and objectives served as the organizational framework for the National LRTP planning process; each future phase was aligned to these elements to ensure that this plan achieves the desired outcomes.

PHASE 2: completed February 2013

IDENTIFY BASELINE CONDITIONS AND MACRO TRENDS: The current performance level and condition of the NPS transportation system, in terms of asset management, financial condition, resource protection, visitor experience, and safety, was established. The planning team also considered macro-level trends that affect the management and delivery of the transportation system, such as demographics, climate change, and technology. The baseline and macro trends assessment highlighted the critical areas of focus and provided a foundation for the subsequent phases to build on.

PHASE 3: completed May 2014

IDENTIFY TRANSPORTATION NEEDS: The findings from the condition and performance assessment stage were used to identify the most crucial needs in meeting the transportation vision, goals, and objectives.

PHASE 4: completed May 2014

DEVELOP STRATEGIES: Short- and long-term actions and strategies were identified to address the transportation needs and meet the stated goals and objectives. As part of this step, five investment strategies were also developed to evaluate different allocation strategies based on forecasted funding from all sources.

PHASE 5: completed June 2014

ESTABLISH PERFORMANCE MEASURES: National level performance measures and targets (where possible) were developed to monitor the National LRTP implementation progress over time. The performance measures were developed with ongoing coordination with the particular NPS directorates and program areas that will ultimately be responsible for implementing strategies to achieve the plan's goals and objectives. The National LRTP does not include performance measures for each specific objective; rather it includes a limited set of measures that the National Park Service will use to monitor progress and ensure that the plan is meeting established goals and objectives.

PHASE 6: October 2014–January 2015

CONDUCT AGENCY OUTREACH AND FINALIZE PLAN: The final plan was shared broadly with agency staff and external partners. As part of the outreach process the team created a page on the Planning Environment and Public Comment (PEPC) website that made general information and plan documents available for review. The team also conducted numerous presentations with targeted audiences to collect feedback on the plan.

Key Findings

This National LRTP identifies a strategic path forward to achieve a the 20 year vision for the NPS transportation system. The plan outlines short- and long-term investment strategies to address transportation needs and to meet the National Park Service's transportation goals and objectives. The key findings from each goal area include:

Facility Management Goal: Sustainably manage NPS transportation facilities and services

- Not all transportation facilities are of equal importance to visitors or park unit operations, and in times of fiscal constraint it becomes increasingly necessary to target transportation investments to the highest priority facilities.
- Understanding outcomes of preventive maintenance spending, will improve the ability of the National Park Service to project future funding needs and lifecycle costs.
- The challenge of climate change requires an adaptive, forward-looking approach to transportation facility management.

Transportation Finance Goal: Allocate available transportation funding wisely

- The National Park Service forecasts $391 million in annual transportation funding but $1.38 billion in annual needs, leaving an annual gap of $993 million (in 2012 dollars).
- The investment needs of the highest priority needs alone total $613 million annually, exceeding forecasted funding by more than 50%.
- The National Park Service can improve the cost effectiveness of investments, increase useful service life, reduce total cost of facility ownership, and reduce deferred maintenance by emphasizing facility priority in the programming process, coordinating financial strategies among different levels of the organization and funding program managers, and fulfilling operations and preventative maintenance needs.

Resource Protection Goal: Protect and preserve natural and cultural resources

- The NPS transportation system can negatively impact natural processes and can pose significant threats to the quality and integrity of sensitive resources and healthy ecosystems within and adjacent to NPS areas.
- Many NPS transportation assets are themselves cultural resources to be enjoyed by park visitors and must be maintained at a high standard and in a context-sensitive manner.
- Although significant progress has been achieved in the last five years at reducing greenhouse gas (GHG) emissions from the transportation sector, further efforts to reduce emissions and sustain these cuts will be necessary in order for the National Park Service to maintain its position as a climate leader and to meet its overall GHG emission reduction goals.

Visitor Experience Goal: Maintain and enhance the quality of visitor experiences

- By reducing transportation barriers – particularly for urban residents, minority communities, and people with disabilities – and managing congestion, the National Park Service will be better able to fulfill its mission by increasing access to opportunities for enjoyment, education, and inspiration for this and future generations.
- The NPS transportation system must keep pace with the evolving needs and expectations of visitors, including their growing use of and reliance on technology.

Safety Goal: Provide a safe transportation system for all users

- While visitor and workforce safety are among the highest priorities of the National Park Service, motor vehicle crashes remain a leading cause of serious injury and fatality within the agency.
- Improved data collection combined with performance-based planning approaches will allow the National Park Service to identify motor vehicle crash trends, improve prevention strategies, and implement safety counter-measures that increase safety on its transportation networks.
- Developing a comprehensive safety management system to collect, analyze, and report transportation safety data is essential for all NPS safety programs, policies, and practices.

Alternative Investment Strategies

Historically, transportation funding has not been sufficient to cover the $1.38 billion needed to operate and maintain the NPS transportation system in a state of good repair. With transportation funding forecasted to decline by 17%, the challenges that the National Park Service faces will only increase.

The National Park Service is continually striving to improve its approach to transportation investments and there are many potential approaches to achieve this goal. This National LRTP explores and compares five alternative investment strategies, each one representing a different philosophy for how transportation funding could best be invested. NPS managers will select an investment strategy and implementation actions in the final plan. The investment strategies are:

- **BUSINESS AS USUAL:** continues the recent investment approach, using historical priorities, asset categories, and asset lifecycle stages, with one exception of increasing investments in bridges.
- **BUSINESS AS USUAL PLUS CAPITAL INVESTMENT STRATEGY (CIS):** continues the historic investment approach in asset categories and asset lifecycle stages (with the exception of bridges), but aligns with the Capital Investment Strategy by strictly prioritizing investments in highest priority needs.
- **ADDRESS DEFERRED MAINTENANCE PLUS CIS:** redirects two-thirds of current investments in day-to-day work to accelerate reduction of the deferred maintenance backlog.
- **ADDRESS OPERATIONS AND MAINTENANCE PLUS CIS:** meets all operations and preventative maintenance needs by redirecting investments from low-priority planning and administration, capital, and recurring maintenance needs.
- **MULTIMODAL PLUS CIS:** invests in a more multimodal transportation system by redirecting investments from other priority roads and bridges to highest and high priority transit, trails, intelligent transportation systems, marinas, and other supporting infrastructure.

Each of the alternative investment strategies has its own unique advantages and disadvantages; whichever path is chosen, it will come with trade-offs. In addition to making strategic changes to its investment strategy, the National Park Service will also need to seek out new funding programs and partners to close the gap between available funding and needs.

Golden Gate National Recreation Area

Next Steps

The National LRTP will require ongoing, active engagement and participation to implement the policy framework and recommended strategies. The National LRTP includes performance measures and targets that the agency will use to monitor progress toward meeting the plan's goals and objectives over time.

The National Park Service is committed to a continuing, cooperative, and comprehensive transportation planning process that will result in regular updates to reflect changing conditions and policies. The agency intends to issue a report card every two years to share the status of the progress. The first update to the National LRTP is scheduled for 2019.

Performance Measures and Targets

Facility Management Measures and Targets Management Measures and Targets

Condition of highest- and high-priority transportation facilities

TARGET: Pending plan review.

Number of park units that have completed a transportation infrastructure vulnerability assessment

TARGET: Complete transportation infrastructure vulnerability assessments for 5–10 park units per year over the next five years.

Transportation Finance Measures and Targets Management Measures and Targets

Percentage of units that are able to meet 55% of preventive maintenance targets on highest priority transportation assets

TARGET: 20% of units in 2015, 40% in year 2016, 60% in year 2017, 80% in year 2018, and 100% in 2019 and subsequent years.

Reduction in deferred maintenance on highest priority transportation assets

TARGET: Pending plan review.

Percent of transportation funds obligated on high-priority transportation assets

TARGET: 75% of transportation funds by 2019.

Resource Protection Measures and Targets

Number of wildlife-vehicle collisions involving the threatened and endangered species subset on all roadways (both NPS managed and non-NPS managed) within NPS boundaries

TARGET: pending 2015 data reporting.

Complete all components of the Innovative and Sustainable Transportation Evaluation Process and Guidance (INSTEP) for planning, design, construction, operations and maintenance of transportation facilities and systems

TARGET: 100% completion of the INSTEP guidance and a majority of transportation projects using INSTEP by 2019.

Aggregate Facility Condition Index rating of highest priority historic Federal Real Property (FRP) assets

TARGET: Pending plan review.

Percentage decrease in NPS transportation system emissions

TARGET FOR SCOPE 1 AND 2 EMISSION SOURCES: Reduction of 35% by 2020.
TARGET FOR SCOPE 3 EMISSION SOURCES: Reduction of 10% by 2020.

Visitor Experience Measures and Targets

Percentage of park unit websites that provide essential travel information

TARGET: 100% of park units by 2019.

Completion of Phase II of NPS Congestion Management System (CMS)

TARGET: 100% of CMS Phase II elements complete by 2019.

Number of transportation contracts that include accessibility language and are compliant with the Architectural Barriers Act Accessibility Standards and section 504 of the Rehabilitation Act of 1973

TARGET: 100% of completed contracts by 2019.

Number of transportation projects that comply with the Architectural Barriers Act Accessibility Standards and section 504 of the Rehabilitation Act of 1973

TARGET: 100% of projects by 2019.

Transportation Safety Measures and Targets

Completion of Transportation Safety Management System components

TARGET: 100% completion by 2019.

Glacier National Park

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Katmai National Park & Preserve

Vision and Goals

NPS Mission Statement

The National Park Service preserves unimpaired the natural and cultural resources and values of the national park system for the enjoyment, education, and inspiration of this and future generations. The Park Service cooperates with partners to extend the benefits of natural and cultural resource conservation and outdoor recreation throughout this country and the world.

National LRTP Vision

The National Park Service provides a mission-focused transportation system that is safe and seamless, enabling high-quality access to essential park experiences. The agency responsibly plans and effectively manages the transportation system to accommodate changing environmental, social, and financial conditions.

Facility Management Goal: Sustainably manage NPS transportation facilities and services

- Maintain critical facilities and services in good operating condition through targeted investment.
- Adapt transportation systems to climate change impacts.

Transportation Finance Goal: Allocate available transportation funding wisely

- Identify and prioritize investments based on agency mission, anticipated lifecycle costs, and consideration of likely available future funding.
- Maintain flexible use of transportation funding sources while improving identification of transportation needs and expenditures.

Resource Protection Goal: Protect and preserve natural and cultural resources

- Incorporate natural and cultural resource protection considerations into all aspects of transportation decision-making and operations to avoid, minimize, or mitigate negative impacts on these resources.
- Minimize and mitigate the greenhouse gas emissions of the NPS transportation system.

Visitor Experience Goal: Maintain and enhance the quality of visitor experiences

- Improve ease of access to and within national park units for all people.
- Advocate creating a range of appropriate transportation options that support a network of seamless connections within each park unit and to surrounding communities.
- Provide state-of-the-art traveler information and wayfinding, and where appropriate, interpretation and education opportunities that complement transportation options.

Safety Goal: Provide a safe transportation system for all users

- Institute a comprehensive, performance-based transportation safety program that addresses engineering, education, enforcement, and emergency response safety components.
- Maximize safety without impairing park resources and values.
- Reduce transportation-related incidents and prepare for emergencies.

Everglades National Park

A New Era of Transportation Planning for the National Park Service

The National Park Service (NPS) National Long Range Transportation Plan (LRTP) sets the comprehensive national vision guiding transportation program priorities and investments servicewide. Transportation is more than systems and facilities; it is the foundation that supports access to the wondrous experiences found in America's national treasures, and therefore plays a critical role in serving the NPS mission. While a keystone to accessing these special places, transportation can also, at times, negatively affect the integrity of natural and cultural resources. Transportation planning in the National Park Service is fundamentally about striking a critical balance between access and resource protection while operating within fiscal constraints. Achieving this balance is ingrained in the National Park Service mission and is part of what makes the National Park Service a unique agency.

This plan provides a 20-year vision, high-level goals and objectives, investment strategies, and performance measures that will shape future transportation investments across the National Park Service. The plan addresses the entire NPS transportation system, which includes

- On-road systems, including roads, bridges, tunnels, parking lots, and signage
- Transit systems, including bus, trolley, tram, and rail
- Marine systems, including ferries, boats, docks, marinas, and waterfronts
- Aviation systems, including runways, maintenance facilities, and loading areas
- Nonmotorized systems, including equestrian, bicycle, and pedestrian paths and trails
- Transportation management systems, including intelligent transportation systems, Congestion Management Systems, and the Transportation Safety Management System

Fort Sumter National Monument

Transportation is a cross-cutting function that touches all directorates and program areas within the National Park Service, and involves a variety of both public and private stakeholders. This plan reflects the input of NPS subject matter experts from across the agency, our partners, and the public, and defines common goals that transcend traditional NPS administrative program boundaries.

Despite the wide impacts of transportation on NPS program areas and the complexity of the asset portfolio, transportation investment decisions beyond roads and bridges historically have not been made as part of a comprehensive, coordinated strategy. To develop, improve, and maintain its transportation assets, the National Park Service historically has obligated $469 million annually from more than 15 major funding sources, each with its own purpose and eligibility funding criteria. While transportation investments are often thought to be the exclusive realm of Federal Highway Administration funding, 40% of annual funding for transportation investments comes from NPS and other fund sources. Traditionally, the various funds are allocated by identifying potential projects at the unit level, and depending upon the funding source, comparing and selecting projects at the regional or national levels using informally defined criteria and priorities. This approach has not consistently considered servicewide use and visitation trends, economic and policy trends, and the relationship between transportation and other NPS program areas.

Because the NPS transportation system has expanded substantially over the years, effective management has become increasingly important to sustain operations into the future and effectively fulfill the NPS mission. In this time of fiscal uncertainty, it is vital for the National Park Service to maximize the benefit of its available funding to address its highest servicewide priorities most effectively. This plan, and the extensive collaborations that produced it, lay the foundation for a new era of transportation planning for the National Park Service, one in which transportation decisions are increasingly made within a more comprehensive and coordinated context, and with greater involvement of NPS programs and partners not traditionally included in transportation planning.

Consistency with Federal Transportation Planning Requirements

The current federal surface transportation authorizing legislation, Moving Ahead for Progress in the 21st Century Act (MAP-21) (23 USC 201), requires federal land management agencies such as the National Park Service to develop long-range transportation plans that are consistent with the continuous, comprehensive, and cooperative long-range transportation planning processes required of state departments of transportation and metropolitan planning organizations (23 USC 134 and 135).

This National LRTP is consistent with those processes and legal requirements. The plan addresses the U.S. Department of Transportation planning factors, as well as additional planning factors that are specific to the NPS mission, including visitor experience and resource protection (see table 1).

Table 1. Comparison of NPS and USDOT Planning Factors

		USDOT Planning Factors							
		Economic Vitality	Safety	Security	Accessibility & Mobility	Environment	Connectivity	Efficiency	System Preservation
NPS Planning Factors	Facility Management	x			x	x	x	x	x
	Transportation Finance	x					x	x	x
	Resource Protection	x				x			
	Visitor Experience	x	x		x		x	x	
	Safety		x	x	x				

Yosemite National Park

The USDOT planning factors, as described in 23 CFR Parts 450 and 500, include

- support the **ECONOMIC VITALITY** of the metropolitan area, especially by enabling global competitiveness, productivity and efficiency
- increase the **SAFETY** of the transportation system for motorized and nonmotorized users
- increase the **SECURITY** of the transportation system for motorized and nonmotorized users
- increase the **ACCESSIBILITY AND MOBILITY** of people and for freight
- protect and enhance the **ENVIRONMENT**, promote energy conservation, improve the quality of life, and promote consistency between transportation improvements and state and local planned growth and economic development patterns
- enhance the integration and **CONNECTIVITY** of the transportation system, across and between modes, for people and freight
- promote **EFFICIENT** system management and operation
- emphasize the **PRESERVATION** of the existing transportation system

Relationship to Other NPS Planning Efforts

This National LRTP identifies a 20 year strategic vision for the NPS transportation system. The path outlined in the National LRTP supports the goals and objectives of other National Park Service and Department of the Interior (DOI) planning efforts, policies, and management tools such as the NPS *A Call to Action*, NPS Capital Investment Strategy, Healthy Parks Healthy People Strategic Action Plan, Green Parks Plan, America's Great Outdoors, NPS *Management Policies 2006*, and others.

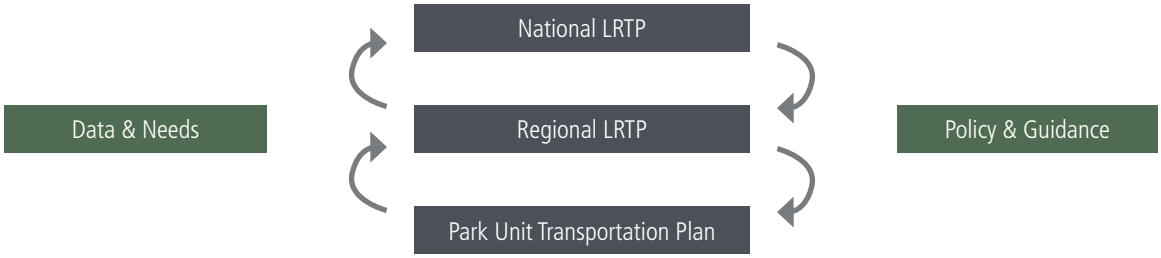
A Call to Action: Preparing for a Second Century of Stewardship and Engagement

A *Call to Action* advances a shared vision for the National Park Service as it enters its second century. The strategic framework describes specific goals and measurable actions that chart a course toward providing exemplary stewardship and public enjoyment of the national parks. The National LRTP supports and furthers many of the actions outlined in *A Call to Action* including

#4 – IN MY BACKYARD: Improve urban residents' awareness of and access to outdoor and cultural experiences close to home by promoting national parks in urban areas and ensuring safe and enjoyable physical connections from parks to a variety of sustainable transportation options aligned with urban populations' needs.
#5 – PARKS FOR PEOPLE: Enhance the connection of densely populated, diverse communities to parks, greenways, trails, and waterways to improve close-to-home recreation and natural resources conservation.
#12 – FOLLOW THE FLOW: Support communities' efforts to expand access to water-based recreation and to protect and restore waterways across the country by establishing a national system of water trails.
#17 – GO DIGITAL: Reach new audiences and maintain a conversation with all Americans by transforming the NPS digital experience to offer rich, interactive, up-to-date content from every park and program.
#19 – OUT WITH THE OLD: Engage national park visitors with interpretive media that offer interactive experiences, convey information based on current scholarship, and are accessible to the broadest range of the public.
#22 – SCALING UP: Promote large landscape conservation to support healthy ecosystems and cultural resources.
#23 – GO GREEN: Further reduce the NPS carbon footprint over 2009 levels, and widely showcase the value of renewable energy.
#24 – INVEST WISELY: Focus investments from all maintenance fund sources on high priority national park assets to address critical deferred maintenance and code compliance needs.
#25 – WHAT'S OLD IS NEW: Modernize historic preservation methods and technologies, show how historic structures can be made sustainable, and support efforts to rebuild the economic vitality of rural and urban communities.
#27 – STARRY, STARRY NIGHT: Lead the way in protecting natural darkness as a precious resource and create a model for dark sky protection.
#28 – PARK PULSE: Assess the overall status of park resources and use this information to improve park priority setting and communicate complex park condition information to the public in a clear and simple way.
#37 – CRYSTAL CLEAR: Protect the health of our watersheds by improving water quality, aquatic habitat, and ensuring adequate flows for public enjoyment.
#38 – ENJOY THE VIEW: Protect clean, clear air and spectacular scenery now and for future generations.

Badlands National Park

The National LRTP also serves as a strategic guide to inform planning and programming decisions at the regional and unit level. At a minimum, future regional long-range transportation plans and unit transportation plans will be consistent with the goals and objectives established in the National LRTP. Regional transportation plans will also be developed to evaluate and respond to regionally unique needs and challenges, and to identify more-detailed strategies to support the NPS shared goals, objectives, strategies, and performance measures. Iterative feedback among the national, regional, and unit levels will inform and strengthen future versions of each.



Plan Development Process

This National LRTP was developed through a servicewide multidisciplinary effort that incorporated the three C's of transportation planning: cooperative, comprehensive, and continuing. The planning process was carried out in six distinct phases described below. A wide variety of NPS staff, including more than 80 subject matter experts at the directorate, region, park, and program level, as well as external stakeholders, including the Federal Highway Administration (FHWA), provided critical input to each phase of the planning process. The National LRTP is a data-based (where feasible) and performance-driven plan that will be updated every five years; subsequent planning efforts will build on the work and performance results of previous plans.

PHASE 1: completed August 2012

ESTABLISH VISION, GOALS AND OBJECTIVES: The planning team, with input from a variety of NPS staff, established a 20 year vision for the NPS transportation system and developed associated goals and objectives. The vision, goals, and objectives served as the organizational framework for the National LRTP planning process; each future phase was aligned to these elements to ensure that this plan achieves the desired outcomes.

PHASE 2: completed February 2013

IDENTIFY BASELINE CONDITIONS AND MACRO TRENDS: The current performance level and condition of the NPS transportation system, in terms of asset management, financial condition, resource protection, visitor experience, and safety, was established. The planning team also considered macro-level trends that affect the management and delivery of the transportation system, such as demographics, climate change, and technology. The baseline and macro trends assessment highlighted the critical areas of focus and provided a foundation for the subsequent phases to build on.

PHASE 3: completed May 2014

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PHASE 4: completed May 2014

DEVELOP STRATEGIES: Short- and long-term actions and strategies were identified to address the transportation needs and meet the stated goals and objectives. As part of this step, five investment strategies were also developed to evaluate different allocation strategies based on forecasted funding from all sources.

PHASE 5: completed June 2014

ESTABLISH PERFORMANCE MEASURES: National level performance measures and targets (where possible) were developed to monitor the National LRTP implementation progress over time. The performance measures were developed with ongoing coordination with the particular NPS directorates and program areas that will ultimately be responsible for implementing strategies to achieve the plan's goals and objectives. The National LRTP does not include performance measures for each specific objective; rather it includes a limited set of measures that the National Park Service will use to monitor progress and ensure that the plan is meeting established goals and objectives.

PHASE 6: October 2014–January 2015

CONDUCT AGENCY OUTREACH AND FINALIZE PLAN: The final plan was shared broadly with agency staff and external partners. As part of the outreach process the team created a page on the Planning Environment and Public Comment (PEPC) website that made general information and plan documents available for review. The team also conducted numerous presentations with targeted audiences to collect feedback on the plan.

How to Read the Plan

The plan is organized around the five strategic goal areas:

- Facility Management
- Transportation Finance
- Resource Protection
- Visitor Experience
- Safety

Within each goal area the plan lays out the baseline conditions, provides recommended strategies to achieve the stated objectives, and lists the performance measures and targets that the National Park Service will use to gauge progress toward meeting the goal and objectives.

The Investment Strategies section presents five potential investment strategies and outlines the associated programming considerations. The four funding scenarios are

- **BUSINESS AS USUAL:** continues the recent investment approach, using historical priorities, asset categories, and asset lifecycle stages, with one exception of increasing investments in bridges.
- **BUSINESS AS USUAL PLUS CAPITAL INVESTMENT STRATEGY (CIS):** continues the historic investment approach in asset categories and asset lifecycle stages (with the exception of bridges), but aligns with the Capital Investment Strategy by strictly prioritizing investments in highest priority needs.
- **ADDRESS DEFERRED MAINTENANCE PLUS CIS:** accelerates the reduction of deferred maintenance by redirecting two-thirds of investments in day-to-day work to recurring maintenance and component renewal.
- **ADDRESS OPERATIONS AND MAINTENANCE PLUS CIS:** meets all operations and preventative maintenance needs by redirecting investments from low-priority planning and administration, capital, and recurring maintenance needs.
- **MULTIMODAL PLUS CIS:** invests in a more multimodal transportation system by redirecting investments from other priority roads and bridges to highest and high priority transit, trails, intelligent transportation systems, marinas, and other supporting infrastructure.

The “Conclusion” section discusses next steps, including the plan for implementation of activities and future plan updates. The “Compendium of Technical Studies” provides more details on the background data and analysis that informed the long-range transportation planning process.

Objectives

- Maintain critical facilities and services in good operating condition through targeted investment.
- Adapt transportation systems to climate change impacts.

Crater Lake National Park

Facility Management

Goal: Sustainably manage NPS transportation facilities and services

The NPS transportation network is composed of both motorized and nonmotorized facilities that accommodate surface, marine, and aviation modes. Together these facilities, which represent a nearly $38 billion public investment, support many of the essential activities of the National Park Service, including one of its core missions of providing visitor access to America's greatest natural and cultural treasures. Furthermore, the NPS transportation network includes nearly 4,000 historic and culturally significant facilities (discussed in detail in the Resource Protection chapter), which the National Park Service manages to preserve their historic character and integrity and their important transportation functions today.

Maintaining transportation facilities is critical to the NPS mission. While the majority of transportation facilities are currently in good condition, the National Park Service does not anticipate that it will be able to continue to maintain all facilities at this condition level. Not all transportation facilities are of equal importance to visitors or park unit operations, and in times of fiscal constraint it becomes increasingly necessary to target transportation investments to the highest priority facilities. To respond to this challenge the National Park Service is developing systems to identify facilities of the highest priority to each individual park unit and targeting these facilities for future capital investments and preventive maintenance. At the same time, the National Park Service is improving database and financial systems so that it may more effectively manage thousands of miles of roads, millions of square feet of parking areas, more than 1,400 bridges, and numerous nonroadway transportation systems.

The National Park Service is improving its approach to facility management to adapt to climate change, recognizing that today's challenges will grow as the effects of climate change become more severe. NPS transportation facilities were built to withstand historic climate conditions. Changes in temperature, precipitation, and sea level have already been observed and are projected to become more significant. Changes in extremes (e.g., high temperatures, floods, and droughts) are expected to increase in many regions and will probably lead to new transportation facility management challenges that must be systematically considered and accounted for when making transportation decisions.

Mount Rushmore National Memorial

Baseline Conditions & Macro Trends

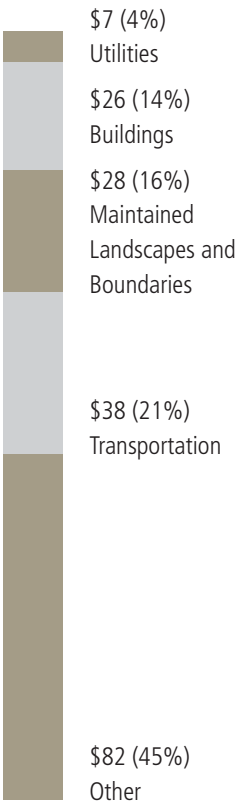
NPS Transportation System Characteristics

The NPS transportation system is extensive, including approximately 5,500 miles of paved roads (figure 2), 120 million square feet of paved parking areas (figure 3), and more than 1,400 bridges (figure 4). The National Park Service also has numerous transit systems, trails, unpaved roads and parking areas, marine and aviation facilities, transportation buildings, fleet vehicles, and fuel systems (table 2). The transportation portfolio represents approximately 21% of the value of all NPS facilities (figure 1), which includes buildings, equipment, and numerous other facility types.

NPS transportation facilities vary significantly among the park units and by region, accounting for different visitation patterns as well as geographical, historical, and cultural characteristics. The overall portfolio of transportation facilities is extraordinarily diverse, but traditional roadway and parking facilities are by far the most common means of providing access to NPS park units, with the notable exception of the Alaska region (AKR), in which many park units are not accessible by road.

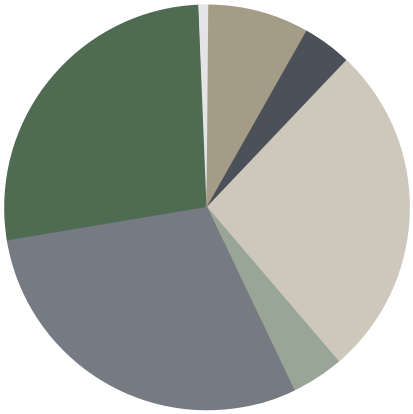
The Intermountain Region (IMR), Pacific West Region (PWR), and Southeast Region (SER) support approximately 1,500 miles of paved roads each, consistent with the expansive territory and remote nature of many western park units and the long parkways and corridors of the southeast. The Northeast Region (NER), National Capitol Region (NCR) and Midwest Region (MWR) maintain fewer miles of paved roads, consistent with the more densely developed settlement patterns of these areas of the United States. However, these three regions comprise a significantly larger share of paved parking areas. Notably, the Southeast Region is home to the majority of all NPS bridges, with more than 800 structures.

Figure 1. National Park Service Transportation Portfolio as a Percentage of All Facilities (By Replacement Value in Billions of Dollars)



Source: Analysis of FMSS data (accessed 2/21/14)

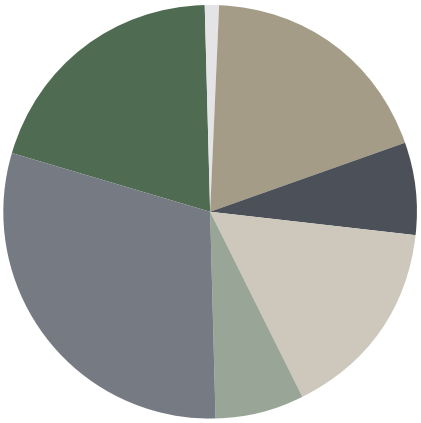
Figure 2. National Park Service Paved Road Miles by Region



PWR 27%
AKR <1%
NER 08%
NCR 04%
SER 27%
MWR 04%
IMR 30%

Source: 2010 National Park Service Pavement Condition Report (NPS 2012a).

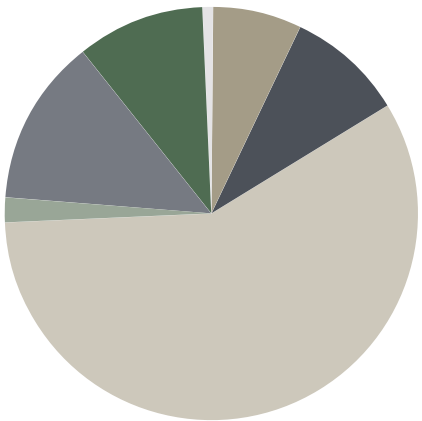
Figure 3. NPS Paved Parking in Square Feet by Region



PWR 20%
AKR <1%
NER 19%
NCR 07%
SER 16%
MWR 07%
IMR 30%

Source: 2010 National Park Service Pavement Condition Report (NPS 2012a).

Figure 4. National Park Service Bridges by Region



PWR 10%
AKR 01%
NER 19%
NCR 09%
SER 58%
MWR 02%
IMR 13%

Source: Federal Highway Administration Pontis database. Note: Not all NPS bridges are listed in Pontis.

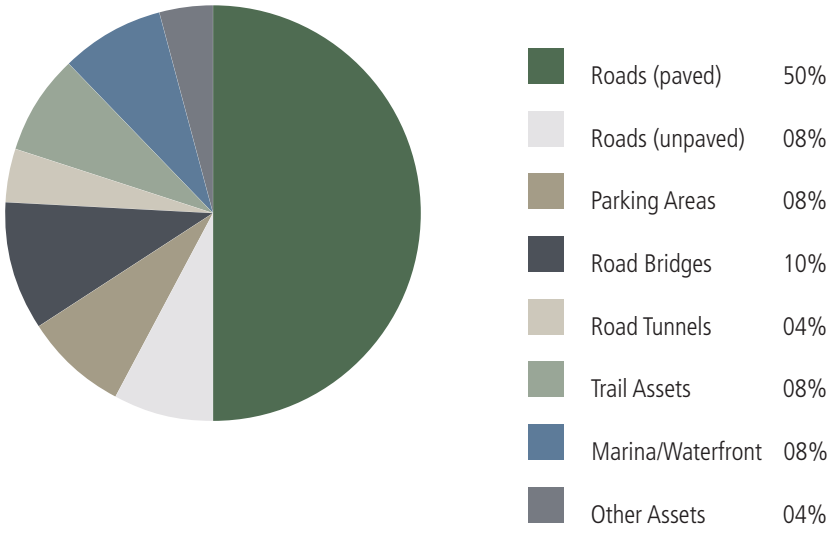
Table 2. Inventory of National Park Service Transportation Facilities

Category	Facility Count	Quantity
Paved Roads	4,000	5,500 Miles
Unpaved Roads	3,900	7,000 Miles
Paved Parking Areas	6,200	120 Million Square Feet
Unpaved Parking Areas	1,800	25 Million Square Feet
Bridge Structures	1400	7 Million Square Feet
Transit Systems	150	150 Systems
Trails	2,250	4,600 Miles
Trail Bridges	950	900,000 Square Feet
Trail Tunnels	40	500,000 Square Feet
Buildings	275	1.75 Million Square Feet
Fuel Systems	450	1.4 Million Gallon Capacity
Constructed Waterways	30	130 Miles
Marina/Waterfront Systems	1,000	2.3 Million Linear Feet
Aviation Systems	60	150,000 Linear Feet
Railroad Systems	250	700,000 Linear Feet
Fleet Vehicles	12,000	12,000 Vehicles

Sources: Analysis of FMSS data (accessed 2/21/14), National Park Service Transit Inventory, 2012 (NPS 2013a) and Transportation Reauthorization Resource Paper (NPS 2013b)

In aggregate, the NPS transportation system represents a substantial public investment. Current Replacement Value (CRV) of all transportation facilities is nearly $38 billion (figure 5). Roads, parking areas, and bridges represent approximately 80% of the total portfolio of transportation facilities, by CRV.

Figure 5. National Park Serivce Transportation Facility Replacement Value by Category



Source: Analysis of FMSS data (accessed 02/21/14)


Zion National Park

Facility Management Systems

Deferred Maintenance

Maintenance that was not performed when it should have been or was scheduled to be and which, therefore, is put off or delayed for a future period.

The National Park Service uses a customized version of an industry-standard asset management platform, known within the agency as the Facility Management Software System (FMSS). FMSS is used to track facility condition information and maintenance needs for all facility types. However, some assets in the FMSS inventory are not easily distinguished between transportation and nontransportation functions (for example, a building could serve a partial transportation function). This and other data challenges (e.g., inconsistent data entry) make it difficult to easily and consistently analyze aspects of the transportation facility portfolio at a national level.

To better link labor transactions to specific assets, the Department of the Interior is launching a new Financial and Business Management System (FBMS) across all of its agencies, including the National Park Service. FBMS will become the system of record for all NPS facilities. The launch of FBMS represents an important opportunity to collect data that should improve the understanding of the costs of operating and maintaining specific assets.

Transportation Facility Condition

The National Park Service uses industry-standard metrics to assess transportation facility condition and to estimate investment needs. For the most common facility types—paved roads, paved parking areas, and bridges—the National Park Service partners with the Federal Highway Administration (FHWA) to inspect transportation facilities and assess their condition using automated tools and engineering expertise. For other facility types (e.g., docks, trails, airfields, unpaved roads, and unpaved parking areas), the National Park Service uses a Facility Condition Index (FCI), which represents the estimated cost of deferred maintenance divided by the facility's current replacement value.

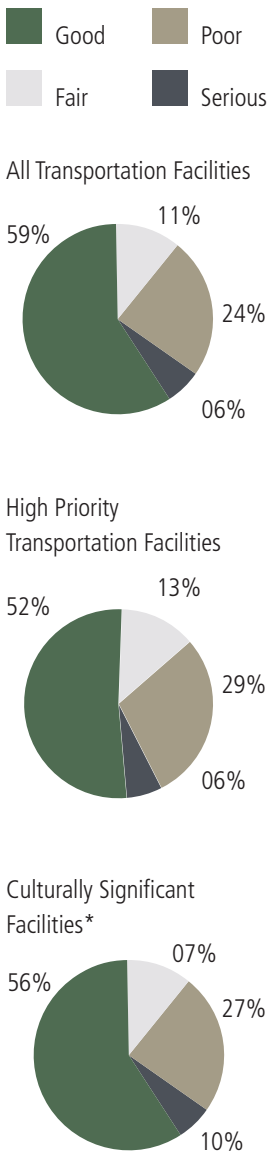
As measured by the FCI, the majority of transportation facilities are in good condition (59%), but problems with deferred maintenance have resulted in more than one-quarter of the remaining facilities falling into poor or serious condition. Notably, as indicated in figure 6 below, both high priority and culturally significant transportation facilities are in slightly worse condition in comparison to the total inventory. These statistics suggest that there is an opportunity to target resources to high priority and culturally significant facilities, which are of special concern.

Pavement Condition

Poor pavement quality can be uncomfortable or even jarring for visitors and in severe cases can impose increased wear and tear on vehicles, decrease vehicle fuel economy, and reduce the safety of roadways. Through regular inspection and maintenance of paved facilities, the National Park Service seeks to minimize total lifecycle ownership costs, while keeping roads and parking areas in good condition. Proactive pavement maintenance extends the effective life of paved facilities while minimizing long-term costs.

The condition of roads and parking areas is jointly monitored by the National Park Service and the Federal Highway Administration through the Roadway Inventory Program (RIP). The program inspects paved surfaces and provides inputs to models that project future maintenance and rehabilitation needs. The models use current pavement condition, projected deterioration, and anticipated available funding to produce a recommended investment strategy of maintenance and rehabilitation activities for all paved surfaces. The models apply funding across the network where it will make the biggest improvement per dollar to system pavement condition rating (PCR), and can be constrained to specified subsets of the network. Figure 7 shows the average pavement condition rating of paved roads, using data gathered between 2005 and 2009 during the most recent completed RIP cycle (cycle 4). Complete data from RIP cycle 5 will not be available until 2015, but forecasts indicate that average pavement condition rating is declining (NPS 2013c).

Figure 6. Condition of National Park Service Transportation Facilities



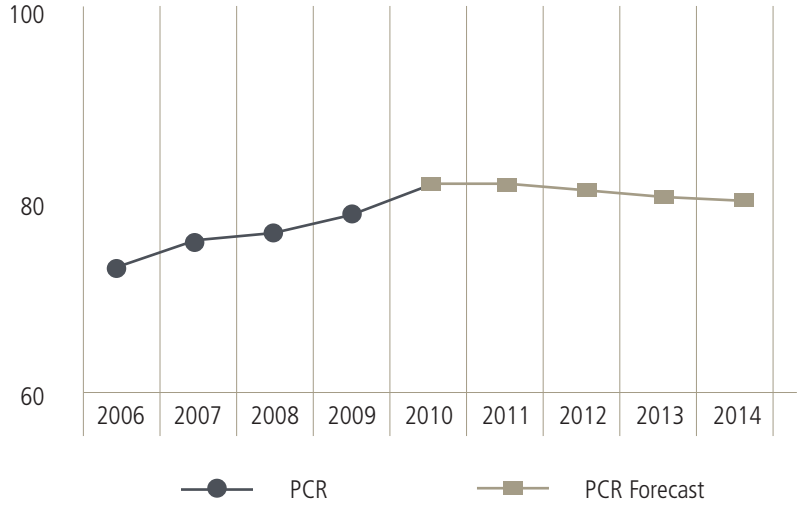
Source: Analysis of FMSS data (accessed 2/21/14)

*Includes facilities that are national historic landmarks, as well as national register listed or eligible, and assets that contribute to them.

Figure 7. NPS Servicewide Average Pavement Condition Rating

Bridge Health Index Classification

92 + = Good
80-91 = Fair
0-80 = Poor



Source: 2011 National Park Service Pavement Condition Report (NPS, 2013c)

Pavement Condition Rating Classifications

Servicewide Target = 85

85 + = Good
61-84 = Fair
0-60 = Poor

Pavement condition increased from an average score of 73.4 in 2006, to 82.0 in 2010, showing steady progress toward the servicewide PCR goal of 85. However, these improvements were due in large part to the influx of funding from the American Reinvestment and Recovery Act. With the sunset of the act in 2010, average pavement condition was forecast to decline from 2010 to 2015, and at current funding levels, projections indicate it will decline further in future years (figure 7). Because available funding is insufficient to maintain all paved facilities in good condition, the National Park Service is working to prioritize investments so that facilities of the highest importance remain in good condition. As discussed later in this chapter, the Capital Investment Strategy is one way that the National Park Service is changing the way it does business to respond to fiscal constraints while minimizing impacts on resources, visitors and essential park unit functions.

Bridge Condition

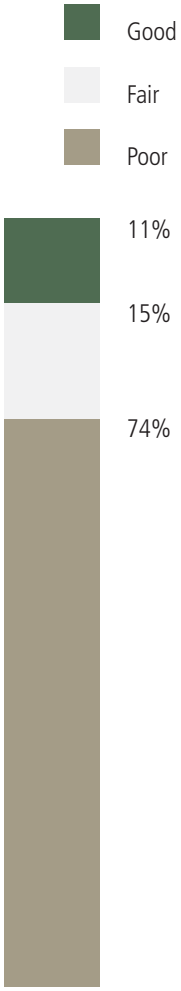
As with roads, the National Park Service inspects and analyzes the condition of all of its approximately 1,400 public roadway bridges through a partnership with the Federal Highway Administration: the Bridge Inspection Program.

The Federal Highway Administration performs bridge inspections on a two-year cycle, assigning a Bridge Health Index rating to each facility based on models that consider structural condition, scour, and rate of deterioration. Bridges are then classified either as good, fair, or poor condition. Nearly three-quarters of bridges are classified in good condition (figure 8).

Similar to the Roadway Inventory Program, the Bridge Inspection Program uses a modeling application that produces a recommended investment strategy for rehabilitation, replacement, and preventative maintenance of bridges, which helps prioritize bridge repair and rehabilitation activities that will make the biggest improvement in overall network condition.

As with other facility categories, the National Park Service seeks to minimize total lifecycle ownership costs by taking proactive steps to keep bridges in good condition and to extend their useful service life before major rehabilitation is needed. However, as with paved surfaces, current funding levels are not sufficient to maintain all bridge facilities in good condition. As with paved facility condition, bridge condition is likely to decline gradually over the next 10 years at projected funding levels. The National Park Service is working to enhance the prioritization of bridge investments to ensure that the most important facilities remain in good condition, and to make the most effective use of limited funding.

Figure 8. Condition Of National Park Service Bridges (2011)



Source: Analysis of FHWA Pontis Database
Note: Not all NPS bridges are listed in Pontis.

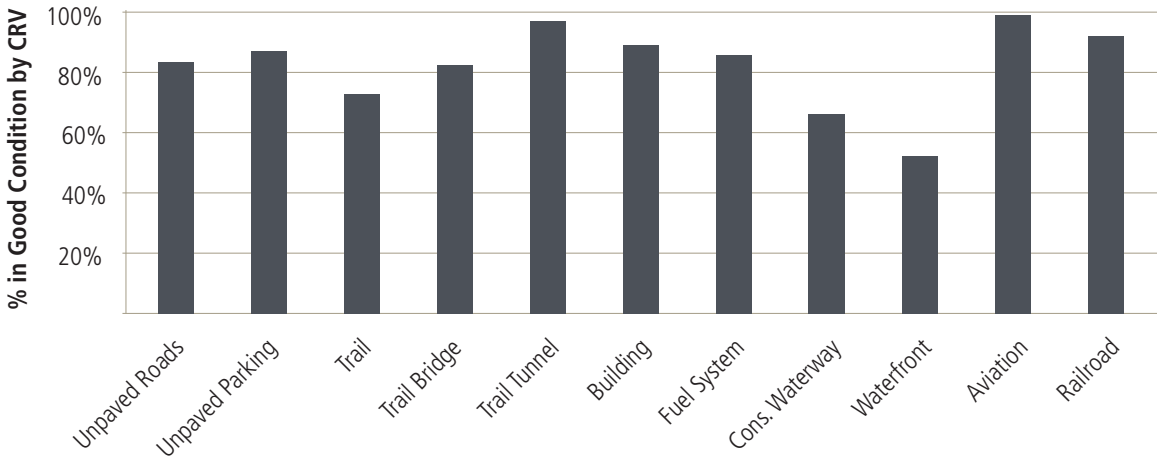
Dry Tortugas National Park

Non-pavement and Alternative Transportation Facility Condition

Paved roads, paved parking areas, and bridges constitute the majority of transportation facilities. However, non-paved assets (unpaved roads and parking areas, nonmotorized trails, docks, and airfields) and alternative transportation systems are also essential parts of the NPS transportation system. These facilities provide critical transportation services and serve as the primary or sole mode of access to some park units.

Servicewide, the vast majority of non-paved and alternative transportation facilities are in good condition (figure 9). However, in some categories less than 85% of facilities are in good condition, indicating a deferred maintenance backlog

Figure 9. Percent of Facilities in Good Condition by Share of Current Replacement Value (CRV) – Unpaved and Alternative Transportation Facilities



Source: Analysis of FMSS data (accessed 2/21)

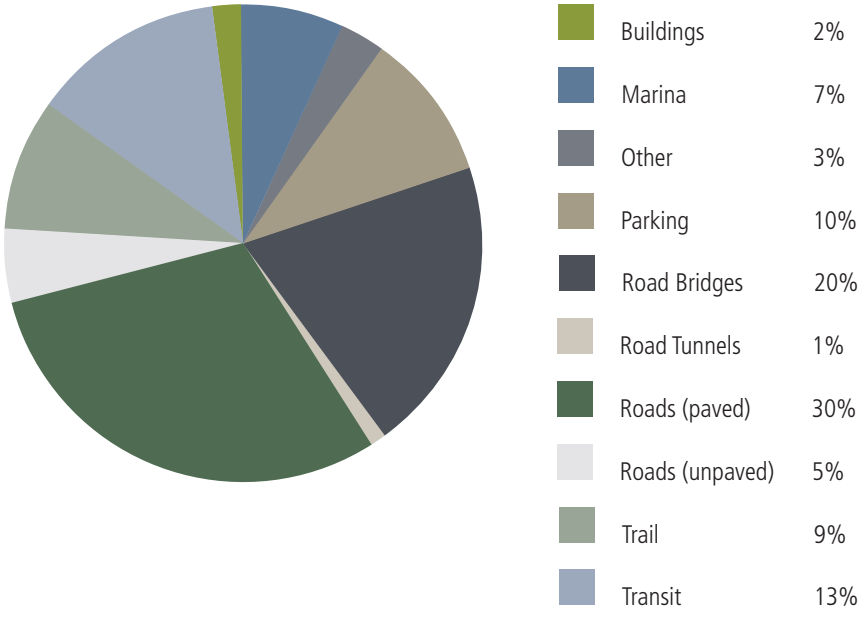
Operations and Maintenance Needs

To keep transportation facilities open and in good condition NPS units must perform operations and maintenance (O&M) activities. These activities include the day-to-day operations work required to keep facilities open and functioning, as well as preventative and recurring maintenance projects designed to prolong the service life of the facility. Typical O&M activities range from basic work such as grass cutting, painting, and trash collection to more substantial activities such as gravel surface maintenance, crack sealing, and road shoulder and drainage system upkeep.

Park units define priorities and O&M schedules for their facilities in park asset management plans. Information on actual expenditures is not aggregated at a national level. However, the National Park Service estimates that nearly $475 million is needed annually to operate and maintain all transportation facilities (figure 10). Further discussion of needs can be found in the "Transportation Finance" chapter of this plan.

O&M activities are an important part of overall facility lifecycle costs. A properly executed O&M plan can significantly extend the useful life of transportation facilities, thereby reducing future needs for capital reinvestment. To improve linkages between the capital and O&M portions of total lifecycle cost estimation, an effort is underway to better define and track O&M requirements for transportation assets and to make actual O&M expenditures available in FMSS, and as inputs to pavement and bridge condition models.

Figure 10. Estimated Annual Operations and Maintenance Requirements for the National Park Service Transportation Facility Inventory



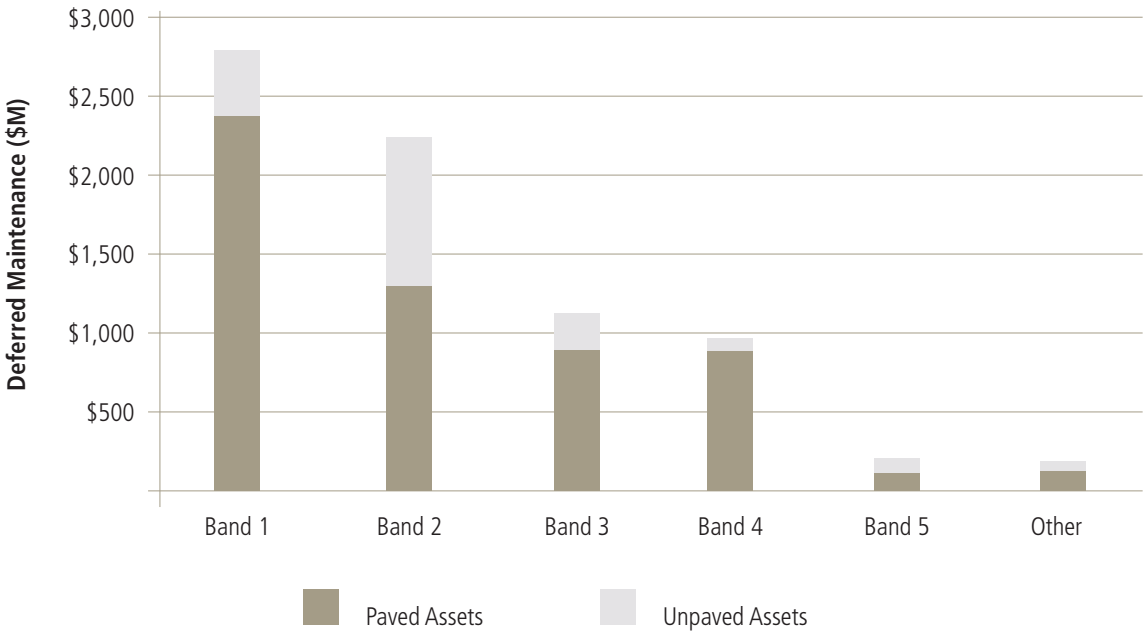
Sources: White Paper: O&M Costs for N-LRTP Transportation Asset Inventory (NPS 2013e), Alternative Transportation Systems Financial Analysis: Phase I Findings and Results, and National Park Service Transportation Reauthorization Resource Paper (2013).

Deferred Maintenance

Due to funding shortfalls, not all necessary or recommended maintenance can be performed for all transportation facilities in each year. This leads to deferred maintenance, a measure of the accumulated total costs necessary to correct deficiencies resulting from unaccomplished past recommended maintenance and repairs. The estimated deferred maintenance backlog for transportation facilities is $7.5 billion. Paved roads, paved parking areas, bridges, and tunnels account for $5.7 billion of deferred maintenance (76%). Non-paved and alternative transportation facilities account for an additional $1.8 billion of deferred maintenance. Servicewide, transportation facilities account for the majority of deferred maintenance across all facility types, or 67% of the total NPS backlog of $11.3 billion.

When facilities do not receive recommended maintenance their condition tends to deteriorate. As a result, although 70% of transportation facilities are in good or fair condition, nearly 80% of the deferred maintenance backlog is attributable to the remaining 30% of facilities in poor or serious condition. Furthermore, deferred maintenance isn't restricted only to low-priority facilities. As shown in figure 11, Optimizer Band 1 and 2 facilities (those classified as highest or high priority) have the highest totals for deferred maintenance.

Figure 11. Distribution of Deferred Maintenance by Facility Optimizer Band



Source: Analysis of FMSS data (access 2/21/14) and FHWA deferred maintenance data, 2013

Grand Tetons National Park

Capital Investment Strategy

Future transportation funding budgets are likely to continue to be flat or to further decline in terms of spending power, and the National Park Service will not be able to maintain all transportation facilities at the current condition level, or to meet condition targets for all facilities. To address this challenge, the National Park Service is in the process of adopting a prioritized approach to facility maintenance, including transportation. The Capital Investment Strategy (CIS) will help the National Park Service focus investment on its highest priority transportation facilities, with a particular emphasis on facilities that park units have committed to maintain over the long term. Successful implementation of the Capital Investment Strategy is critical to making the most of limited funding and ensuring that important transportation facilities are kept in good condition.

The Capital Investment Strategy uses a formula to prioritize proposed projects, scoring them in four elements: 1) financial sustainability, 2) resource protection, 3) visitor use, and 4) health and safety. Scores in each element are then weighted based on project goals to calculate an overall project score. These scores provide consistent information to managers to help them allocate limited resources among proposed projects, with priority given to those projects which most effectively manage long-term lifecycle costs.

Capital Investment Strategy Scoring Categories

1. Financial Sustainability (50%)
2. Visitor Use*
3. Resource Protection*
4. Health and Safety*

* Weighted based on project goals

Optimization of Facilities

The relative importance and condition of a facility, known as the "Optimizer Band" position, is an important aspect of the Financial Sustainability score in the Capital Investment Strategy. Optimizer bands are used to identify high- and highest-priority facilities within each park unit that are currently in good condition. For the national long-range transportation plan, "highest" priority facilities are defined as those assigned to Optimizer Band 1. "High" priority is defined as those facilities assigned to Optimizer Band 2. Assigning facilities to Bands 1 and 2 is a commitment by the park unit to fund preventative maintenance of the facility, thereby sending a message to regional fund managers that capital investments made in these facilities will be maintained.

Historically, preventative maintenance decisions were not linked to measures of facility importance or priority. This can be seen in table 3, which shows that the deferred maintenance backlog for transportation facilities is relatively proportionate to the replacement value of those facilities in each optimizer band. Facilities assigned to Band 1 and 2 account for approximately 60% of NPS transportation facilities (by replacement value) and two-thirds of the deferred maintenance. Now, as part of the Capital Investment Strategy, park unit managers are required to first spend preventive maintenance funding on Band 1 and 2 facilities, in order to maximize their service life and minimize long-term costs. Targeting funds toward facilities by CIS ranking is projected to reduce the deferred maintenance backlog and improve the condition of priority facilities over time.

Table 3. National Park Service Transportation Facilities Characteristics by Optimizer Band

	Current Replacement Value	Deferred Maintenance
Band 1	$14,300 (38%)	$2,800 (37%)
Band 2	$8,000 (21%)	$2,200 (30%)
Bands 3–5	$15,200 (41%)	$2,500 (33%)
Total	$37,500	$7,500

Source: Analysis of FMSS data (accessed 2/21/14)

Addressing data consistency in NPS management systems is an important step in the full implementation of the Capital Investment Strategy. The National Park Service is addressing this issue by working with park unit staff to "re-optimize" their assignment of facility priorities to reflect current facility management policy, which will ensure consistency across all park units. The re-optimization process will be completed for all NPS regions by the end of 2014, establishing a consistent dataset of park unit priorities that will enable the National Park Service to better align transportation capital investments with on-the ground management concerns.

Gateway National Recreation Area

Facility Adaptation and Resilience

Global climate change presents new challenges for transportation facility management. Transportation infrastructure is designed to withstand a range of historic seasonal fluctuations in temperature and precipitation, as well as occasional extreme weather. However, as future conditions exceed historic norms on a more-frequent basis, the condition and longevity of transportation facilities may be negatively affected. Changes in temperature, precipitation, and sea levels may accelerate degradation of physical assets and in the most extreme cases, may result in catastrophic damage or loss.

Early impacts of climate change have already been observed and they are expected to increase in severity over time. It will become increasingly necessary to adapt existing transportation facilities to be resilient to changing conditions (e.g., more frequent and severe extreme weather events and rising sea levels). Table 4 summarizes a range of projected climate change impacts presented in the 2014 National Climate Assessment (Melillo, Richmond, and Yoge 2014), and their probable implications for transportation facilities (Transportation Research Board 2008).

Table 4. Projected Climate Change Impacts and Implications for Transportation Facilities

Projected Impacts	Implications for Transportation
Temperature	
- Changes vary by region, but average annual temperature is expected to continue to rise. - Heat waves are projected to become more intense. - The number of extreme hot days is projected to increase. - Cold waves are projected to become less intense. - Length of the frost-free season is projected to increase. - Ice volumes on land, lakes, and seas are projected to reduce, including increased melting of permafrost.	- Accelerated degradation of infrastructure. - Increased maintenance and rehabilitation needs. - Increased safety and accessibility concerns for nonmotorized transportation. - Reduced seasonal operations for over-snow/ice systems. - Reduced need for plowing and salting. - Changes in visitation patterns from summer to spring and fall. - Changes in visitor usage of transportation facilities. - Changes in water levels and stream flow timing in waterways used for transportation.
Precipitation	
- Changes vary by region, and direction of change is uncertain. - Frequency and intensity of extreme precipitation events is projected to increase. - Hurricane-associated storm intensity and rainfall rates are projected to increase. - Droughts in the southwestern U.S. are projected to become more intense. - More winter and spring precipitation is projected for the northern U.S. and less in the southern U.S.	- Increased damage to infrastructure due to flooding. - Increases in closures due to flooding. - Increased maintenance and rehabilitation needs. - Bridges, culverts, and soil systems more frequently washed out, eroded, or damaged from scour. - Potential that bridges, culverts, and drainage will be unable to accommodate higher peak stream flows and that wildlife migration paths through them will narrow or disappear.
Sea-Level	
- Sea level is projected to rise 1 to 4 feet by 2100. - More severe storm surge during extreme events is expected.	- Increased inundation of low-lying coastal areas. - Increased damage to coastal infrastructure during storm events. - Temporary or permanent closure of critical transportation facilities, possibly limiting accessibility to coastal areas.

Sources: Third National Climate Assessment (Melillo, Richmond, and Yoge 2014), Potential Impacts of Climate Change on U.S. Transportation (Transportation Research Board 2008)

A Historic Challenge for the Transportation Industry

A significant challenge for the National Park Service (and for the transportation sector as a whole) is the lack of a generally accepted methodology for identifying transportation infrastructure at increased risk of damage or loss as a result of the impacts of climate change.

Even when vulnerable infrastructure is identified, standard methods do not exist for integrating consideration of these risks into facility management and design practices. Nevertheless, pilot efforts to better understand and respond to climate threats are underway in selected park units and regions, and many state and regional transportation agencies are moving forward as well. The National Park Service has an opportunity to learn from these pilot efforts and to collaborate with partners attempting to deal with the challenge of climate change. Without effective consideration of climate change hazards, transportation facilities may be more frequently damaged or destroyed.

Preparing for and Responding to Change

The National Park Service takes climate change seriously, and is working both to reduce transportation emissions (see the "Resource Protection" chapter), and to prepare for and respond to a changing world. The National Park Service is helping to address this challenge, with several pilot efforts at the NPS park unit or regional levels (table 5), and with offices and programs dedicated to climate change science, mitigation, adaptation, and education.

Table 5: Selected National Park Service Climate Change Adaptation Pilot Efforts

Office/Region/Unit	Description
Alaska Region	Started an analysis of vulnerability to climate change in 2014, focusing on coastal erosion and permafrost thaw. The project is an outgrowth of the Alaska Federal Lands Long Range Transportation Plan, which identified adaptation to climate change as a key objective for the region.
Assateaque Island National Seashore	Incorporating climate change and sea level rise considerations into an update of the park unit's general management plan.
Cape Cod National Seashore	Participated in an interagency transportation, land use, and climate change scenario planning pilot project. Completed in 2012, the project informed the park unit's climate action plan and provided information for use in land use and transportation planning partner agencies on Cape Cod.
Intermountain Region and Climate Change Response Program	Participating in a Central New Mexico interagency transportation, land use, and climate change initiative. Launched in July 2013, the initiative seeks to develop regional climate futures that can inform transportation and land use planning by the NPS park units, other federal land management agencies, and regional/local agencies in central New Mexico.
Natural Resource Stewardship and Science Office	Partnered with Western Carolina University to analyze the vulnerability of facilities to a 1 meter rise in average sea level. The project examined 40 selected coastal park units. Partnered with the University of Colorado to provide sea level and storm surge projections for 105 coastal park units.
Northeast Region	Conducting an analysis of the vulnerability of transportation facilities, focused on flooding. Started in 2013, the project is an outgrowth of the National Park Service Northeast Region Long Range Transportation Plan, which identified adaptation to climate change as a key objective. In addition to the vulnerability analysis, the study will also develop recommendations for how to systematically address current and future flood vulnerabilities in the region's transportation planning and programming processes.

Office/Region/Unit	Description
Southeast Region, FHWA, NPS, and U.S. FWS	The National Park Service, together with partners in the Federal Highway Administration and the U.S. Fish and Wildlife Service (U.S. FWS) collaborated on the development of a tool for use in assessing the vulnerability of transportation assets in the Southeast Region. The tool was piloted by two park and two refuge units. The spreadsheet-based tool will help park unit and regional managers make more-informed decisions about where and how to spend transportation funds, either to enhance the resiliency of vulnerable facilities, or to adapt their design to be resilient in the face of more extreme events.
Sustainable Operations and Climate Change Branch	The Sustainable Operations and Climate Change branch developed and applied a high-level risk screening tool and approach, to assess risk posed by sea level rise to facilities within coastal parks. The tool was piloted at Pu'uhonua o Honaunau National Historical Park in Hawaii and Assateague Island National Seashore in Maryland and Virginia.

Sources: Alaska Federal Lands Long-Range Transportation Plan (BLM et al. 2011); Assateauge Island National Seashore General Management Plan Update (NPS 2013d); Cape Cod Climate Change Scenario Planning Project (Rasmussen et al. 2012); Central New Mexico Climate Change Scenario Planning Project (U.S. DOT Volpe Center 2014)

The NPS Sustainable Operations & Climate Change (SOCC) branch of the Park Facility Management Division is focused on ensuring all NPS facilities (transportation or otherwise) are sustainable in the face of climate change, and on mitigating the impacts of NPS transportation on the climate. The SOCC branch is currently working to develop improved data and tools to help park managers identify climate-related risks, and to make educated adaptation decisions. One notable effort is the branch's work to develop and apply a high-level risk screening tool and approach to assess risk posed by sea level rise to facilities within coastal parks. The tool was piloted at Pu'uhonua o Honaunau National Historical Park in Hawaii and Assateague Island National Seashore in Maryland and Virginia. Sustainable Operations & Climate Change also led the development of the NPS Green Parks Plan (NPS 2012b), a key policy document that establishes priorities for climate change mitigation and adaptation.

The NPS Climate Change Response Program is a cross-disciplinary program that provides guidance, training, technical expertise, project funding, and educational products that support actions to preserve the natural and cultural resources and values of the National Park Service. As part of its overall response to the threats of climate change, the Climate Change Response Program developed the NPS Climate Change Response Strategy (NPS 2010) and Climate Action Plan 2012–2014 (NPS 2012c), which outline long-term strategy and short-term actions for combating climate change servicewide. The program supports park units in many aspects of climate change planning that are relevant for transportation, including scenario planning and climate modeling. The Climate Change Response Program works with park units to use the best available scientific information to create a set of plausible climate futures, which can inform managers' decision making. The program also provides detailed guidance to park units in mitigating their impacts on the climate through its Climate Friendly Parks Program (see the "Resource Protection" chapter).

Mesa Verde National Park

Meeting Facility Management Objectives

Objective: Maintain critical facilities and services in good operating condition through targeted investment

The National Park Service has succeeded in effectively managing its extensive, diverse transportation facilities in the face of limited funding and incomplete information. The majority of the $38 billion portfolio of transportation assets is currently in good condition. However, the accumulated deferred maintenance backlog of $7.5 billion indicates a continuing and mounting challenge.

Currently the National Park Service has limited insight into the outcomes of funding spent on facility operations and preventive maintenance. Understanding outcomes of preventive maintenance spending, in particular, will improve the ability of the National Park Service to project future funding needs and lifecycle costs. This improved information can be used for multiple purposes, among them informing park and regional long-range transportation plans and updates to the national long-range transportation plan, and supporting effective implementation of the Capital Investment Strategy. In particular, the implementation of the Financial and Business Management System presents an opportunity to address data quality issues and to consistently identify all transportation facilities.

Recommended Strategies:

- Improve identification of transportation assets in facility and financial management databases to enable consistent analysis servicewide.
- Ensure highest and high-priority transportation facilities remain in good condition by incorporating the Capital Investment Strategy into prioritization and programming decisions.
- Develop a feedback mechanism to incorporate actual operations and preventive maintenance expenses into facility lifecycle costs and needs modeling.

Objective: Adapt transportation systems to climate change impacts

The challenge of climate change requires an adaptive approach to transportation facility management. As with other transportation agencies, NPS facility management practices are currently grounded in the traditional approach, which assumes that future years will be the same as previous ones. Climate change adaptation requires parks to learn from the past, but be forward-looking, anticipating plausible and sometimes unprecedented conditions. This may include revisiting park management goals and desired conditions because frequently these describe expectations based on historic conditions. The National Park Service needs a modified approach that is forward-looking, anticipating the projected changes in temperature, precipitation, and sea-levels.

In order to adapt to climate change, the National Park Service will need to improve its ability to identify transportation facilities that are vulnerable to a changing climate. Furthermore, facility management and planning processes must account for projected future conditions in order to remain efficient and to mitigate increasing exposure to climate change hazards.

Efforts to define guidance and tools to better equip transportation facility managers to address and prepare for the effects of climate change are already underway. Continued experimentation, research, and partnerships will help the National Park Service better understand what does and doesn't work for specific facility types as well as regional variations in past and projected future climate. Learning and working with state and regional partners will be an important source of information in these efforts. Finally, it will be important to find effective ways to alter standard management practices to institutionalize a proactive approach to climate change adaptation that incorporates best practices and innovations.

Recommended Strategies:

- Expand and refine efforts to identify infrastructure most at-risk to the impacts of climate change, working with partners to prevent duplication, share lessons learned, and minimize costs.
- Integrate consideration of climate change into transportation facility management and planning processes.
- Use industry best practices in sustainable transportation construction, operations, and maintenance to adapt or increase the resiliency of transportation assets to climate change effects.

George Washington Memorial Parkway

Measuring Performance

Facility Management Performance Measure: Condition of highest- and high-priority transportation facilities.

The average servicewide condition of highest and high-priority transportation facilities measures the overall effectiveness of the NPS transportation facility management approach. As the Capital Investment Strategy intends, directing funds towards the most important assets will best position the National Park Service to meet its mission. Facility condition ratings will also provide one measure of the effectiveness of climate change adaptation efforts.

Highest- and high-priority facilities are defined as facilities in Band 1 and Band 2 of the re-optimized NPS inventory. Condition measures and targets are listed below by facility type; however, all three targets represent an equivalent "good" condition.

Roads and Parking Areas
- Measure: Pavement Condition Rating (PCR)
- Servicewide Baseline (2010): 82
- Target: Pending plan review

Bridges
- Measure: Bridge Health Index (BHI)
- Servicewide Baseline (2010): 92
- Target: Pending plan review

All Other Transportation Assets
- Measure: Facility Condition Index (FCI)
- Servicewide Baseline (2010): 0.19
- Target: Pending plan review

Facility Management Performance Measure: Number of park units that have completed a transportation infrastructure vulnerability assessment.

Understanding which facilities are vulnerable to the projected effects of climate change is essential to effective long-term facility management. Several efforts, led by NPS regions, the Climate Change Response Program, the Sustainable Operations & Climate Change branch, and partners are moving quickly to address climate change adaptation and resiliency. In some cases, pilot projects have identified transportation facilities that may be vulnerable either now or as climate change progresses. These efforts should continue and accelerate, to ensure that park unit and regional managers have adequate information to direct transportation funding in ways that account for climate change.

TARGETS: Complete transportation infrastructure vulnerability assessments for 5–10 park units per year over the next five years.

Objectives

-Identify and prioritize investments based on agency mission, anticipated lifecycle costs, and consideration of likely available future funding.

-Maintain flexible use of transportation funding sources while improving identification of transportation needs and expenditures.

Cuyahoga Valley National Park

Transportation Finance

Goal: Allocate available transportation funding wisely

The National Park Service is responsible for investing in, operating, and maintaining a transportation system that protects America's spectacular natural and cultural resources while providing safe and seamless travel options for visitors. Funding the NPS transportation system is an ongoing, multiyear effort that incorporates input from every level of the agency as well as the Department of the Interior and the Department of Transportation.

But the financial health of the NPS transportation system is failing. Between fiscal year 2006 (FY2006) and FY2012, the National Park Service invested on average $469 million per year in its transportation assets. In recent years, funding levels for the most significant transportation funding programs have leveled, dropped, or been eliminated, and the National Park Service forecasts an annual average of $391 million in funding for capital, operations, and maintenance needs for the period FY2015 through FY2020. Yet annual unconstrained needs are estimated to be $1.38 billion, leaving an annual $993 million unmet gap. The highest priority annual needs alone total $613 million and exceed total annual forecasted funding by almost $200 million.

Under the forecasted funding outlook, the National Park Service will be unable to keep up with ongoing maintenance needs and resolve its cumulative deferred maintenance backlog for transportation assets, currently valued at $7.5 billion. All available funding for maintenance will need to be carefully balanced among asset lifecycle stages. The National Park Service has historically allocated the majority of maintenance funding to heavy maintenance, rehabilitation, and reconstruction projects that improved assets' condition and reduced deferred maintenance. But NPS units have not had the resources needed to perform the required day-to-day preventative maintenance on those same assets. Failure to perform preventative maintenance accelerates decay; cuts short useful service life; fails to maximize the cost effectiveness of investments in heavy maintenance, rehabilitation, and reconstruction; and increases deferred maintenance in the long run.

The National Park Service is implementing the Capital Investment Strategy (CIS) to address these issues and achieve maximum benefits with the limited funding it has. By aligning capital and heavy maintenance funding with corresponding funding for operations and preventative maintenance, the National Park Service will lower the total cost of facility ownership, extend the useful service life of its assets, and improve cost effectiveness of every dollar spent. By focusing investments on highest priority assets and services, the National Park Service will take care of the transportation facilities having the greatest importance to park units and visitors. By dispossessing lowest priority assets, the National Park Service will reduce its overall need and focus even more on highest priority needs. And by making these strategic improvements, the National Park Service will sharpen its ability to communicate financial transportation needs to internal and external audiences.

Great Smoky Mountains National Park

Baseline Conditions & Macro Trends

This long-range transportation plan presents historical spending, forecasted funding, fiscally unconstrained needs, and funding gaps according to three main concepts: priority, asset lifecycle, and asset category. All figures presented in this chapter are adjusted to FY2012 dollars, and all identifiable American Recovery and Reinvestment Act investments have been removed. Comprehensive analysis methodologies are available in the "Financial Technical Report."

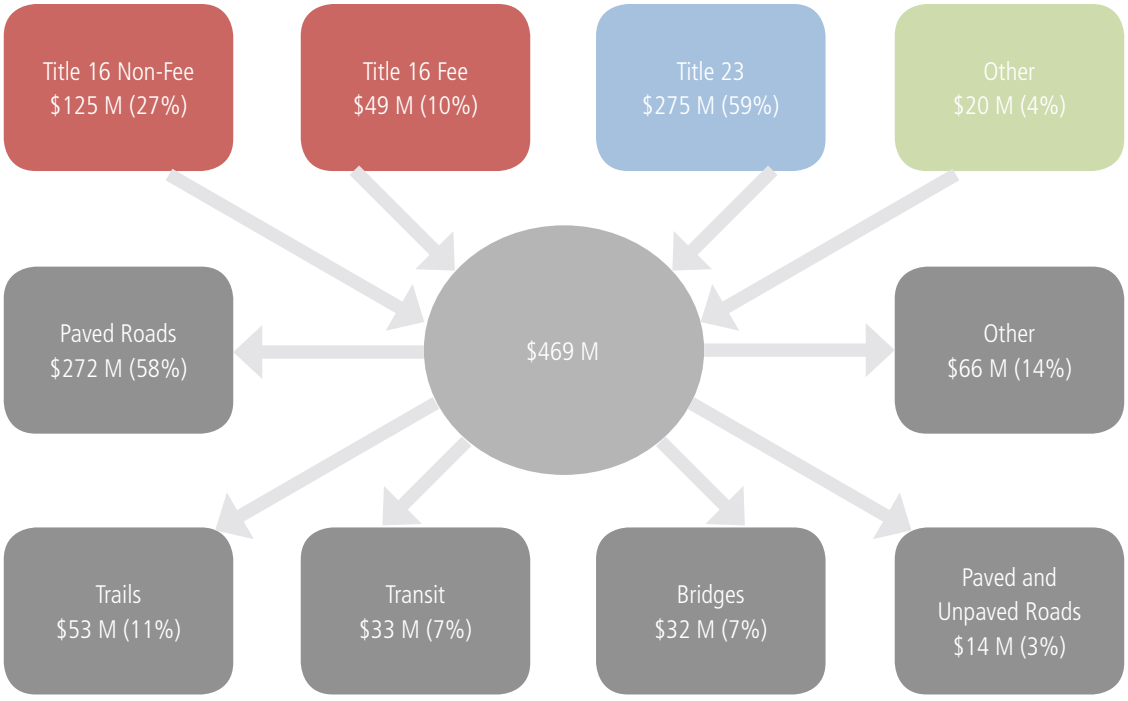
Historical Spending

During the years FY2006 through FY2012, which coincides with the previous federal surface transportation program authorization, the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), the National Park Service invested $3.3 billion, or on average $469 million each year. With this funding, the National Park Service improved more than 2,500 centerline miles of paved roads, rehabilitated 232 bridges, constructed or improved 29 nonmotorized trails, planned and/or implemented 104 transit projects, completed 10 water infrastructure projects, and updated road and bridge inventory condition data several times each. The National Park Service invested roughly two-thirds of all transportation funding in paved assets including roads, bridges, and parking, and 87% of transportation funds in the highest and high priority needs. Yet despite the significant level of investment and associated tangible accomplishments, capital, operations, and maintenance needs outpaced available funding.

Funding Sources

During the period FY2006 through FY2012, 15 of more than 60 funding programs accounted for roughly 95% of NPS transportation funding. As shown in figure 12, 59% of the funding came to the National Park Service through the Federal Highway Administration (FHWA) programs authorized under Title 23 of the United States Code (USC). Thirty-seven percent of the funding came through the Department of the Interior via programs authorized under USC Title 16. Other sources comprised the remaining 4% of transportation funding sources during this period.

Figure 12. Average Annual NPS Transportation Funding by Source and Asset Category, FY2006–FY2012.



Source: NPS Administrative Finance System

Title 23 Fund Sources

The Federal Lands Transportation Program (FLTP, formerly known as the Federal Lands Highway Program) constituted 48% of overall NPS transportation obligations, making it the largest contributor to NPS transportation funding. Unlike other Title 23 programs, FLTP was administered jointly by the National Park Service and the FHWA Office of Federal Lands Highway. It was the most significant stable transportation funding source that was dedicated solely to NPS transportation. The National Park Service allocated FLTP funding first by category and then by priority within category. Category I funded roads and bridges, Category II funded parkways, and Category III funded transit, trails, and intelligent transportation systems.

FHWA discretionary programs contributed an additional 11% of total NPS transportation spending. All of these programs, including the Scenic Byways Program, the Public Lands Highway Discretionary (PLH-D) and Ferry Boat Discretionary Programs, and Transportation Enhancements, were modified or discontinued under the successor bill to SAFETEA-LU, Moving Ahead for Progress in the 21st Century (MAP-21), as discussed below in the forecast section.

The National Park Service used Title 23 fund programs mostly to pay for capital investments.

Title 16 Fund Sources

Approximately $174 million (37%) of transportation funding originated from seven primary (and many other) sources authorized by Congress under Title 16. While the multitude of fund sources provided redundancy for funding requests, transportation planning and decision-making burdens were shared by many fund program managers at all levels of the National Park Service. Opportunities to improve strategic coordination exist.

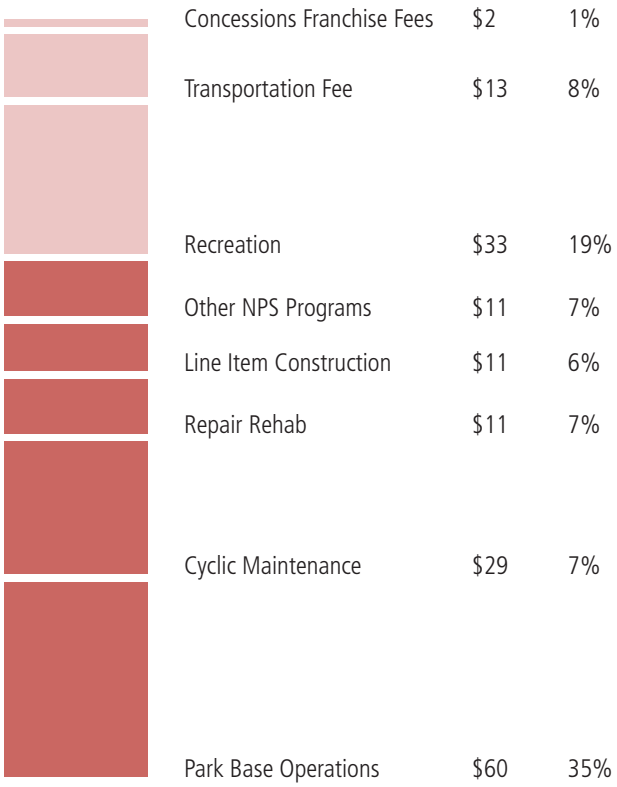
Park Base Operations, the most significant Title 16 program, funded $60 million (13%) of total transportation investments, mostly operations and light maintenance. NPS units programmed Park Base Operations.

Other Title 16 Non-Fee funding programs, including Cyclic Maintenance, Repair/Rehabilitation, Line Item Construction, and others, accounted for 14% of transportation funding. As with Park Base Operations, these programs are not dedicated to transportation. These fund programs were allocated among the seven NPS regional offices, and then parks competed for funding through formalized processes.

Three Title 16 Fee programs provided 10% of transportation funding. Fee revenues were directly related to visitation levels, which were relatively stable servicewide except for severe, infrequent disruptions such as the FY13 government shutdown and Hurricane Sandy. The National Park Service was authorized by Congress to charge visitors recreation fees, transportation fees, and concessions franchise fees to help fund the facilities that they use. Besides FLTP, transportation fees were the only other fund source dedicated to NSP transportation. Concessions franchise fees were paid from concessioners to the National Park Service from the fares private operators charged visitors.

The National Park Service paid for operations and maintenance predominantly with Title 16 fund programs. The challenges of dividing funding responsibilities by titles are described below in the section “Obligations by Asset Lifecycle Stage.”

Figure 13. Average Annual Funding for Transportation from Title 16 Fund Programs, FY2006–FY2012 (in Millions).

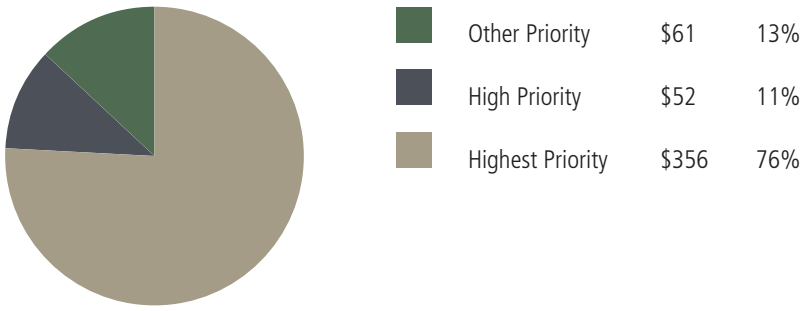


Source: NPS Administrative Finance System

Other Fund Sources

Approximately 4% of all transportation funding originated from sources outside of Title 23 and Title 16. The National Park Service received 159 direct grants totaling $61.6 million from the Transit in the Parks (TRIP) program, now discontinued under MAP-21.[1] Other federal agencies and nonfederal organizations such as state departments of transportation and local governments contributed an average of $8.7 million in reimbursable agreements each year to help accomplish mutually beneficial projects. Finally, the National Park Service received $2 million on average each year from private corporations, nonprofit organizations, and individuals to fund transportation investments.

Figure 14. Average Annual Estimated Transportation Investment by Priority, 2006–2012 (in Millions).



Source: NPS Administrative Finance System

1. An additional $46.8 million was awarded to NPS partners during this same period.

Obligations by Priority

The National Park Service is committed to focusing investments from all fund sources on its highest priority facilities and services. This concept is at the core of the Capital Investment Strategy, introduced on page 25 in the "Facility Management" chapter. Although the National Park Service is in the process of updating priority-defining optimizer bands for all assets, historically the agency used different definitions of priority for different asset types. The use of optimizer bands has not been formally adopted for all asset categories, including roads, bridges, and transit. Thus this long-range transportation plan considers highest, high, and other priorities shown in table 6.

Table 6. LRTP Investment Priorities by Mode

Asset Categories	Highest Priority	High Priority	Other
Paved Roads	API>=88	75-87	API=<74
Trails	Band 1	Band 2	Bands 3, 4, 5
Transit	All	None	None
Bridges	All	None	None
Parking Lots	API>=88	75-87	API=<74
All Other	Band 1	Band 2	Bands 3, 4, 5

Between FY2006 and FY2012, an estimated $356 million, $52 million, and $61 million was spent annually on highest, high, and other priority assets, respectively, as shown in figure 3.[2] These figures, which are based on road investments, may actually overestimate spending on highest and high priority assets and underestimate spending on other priority assets. Although past funding was invested in lower priority assets, future strategies will aggressively target spending on highest or high priority assets.

Obligations by Asset Type

The National Park Service operates and maintains a large and varied portfolio of transportation assets and services, previously introduced in the "Facility Management" chapter. Figure 13 and table 6 summarize the investment allocation among transportation asset types during the period FY2006 through FY2012. Paved roads received $271 million (58%) of total transportation funding. Almost 80% of funding for roads came from FLTP and Park Base Operations. Trails received the next largest investment of $53 million (11%) and transit systems received $33 million (7%). Recreation and transportation fees, FLTP, and TRIP accounted for almost all transit spending.

2. Priority was not available for historical obligations in general, but a study of historical spending on roads at the sixteen largest parks was used to create an estimate: Park Facility Management Division. Five-Year NPS Transportation Spending Summary, Fiscal Years 2007–2011: Transportation Data Analysis for the NPS National Long Range Transportation Plan. June 18, 2013, page 10, table 5.

Table 7. Average Annual Historical Obligations of Asset Types by Funding Title and Program, FY2006–FY2012 (in Millions).

Funding Title and Program	Paved Roads	Trails	Transit	Bridges	All Parking	All Other	Grand Total	% of Grand Total
Title 16	$76.0	$33.6	$21.0	$5.7	$8.2	$28.7	$173.2	37%
Title 16 Non-Fee	$66.2	$23.4	$3.4	$4.2	$3.3	$24.20	$124.5	27%
Park Base Operations	$41.6	$9.4	$2.5	$0.0	$0.1	$6.7	$60.3	13%
Cyclic Maintenance	$16.7	$5.9	$0.2	$1.6	$1.0	$3.8	$29.2	6%
Repair/ Rehabilitation	$3.0	$3.5	$0.0	$1.9	$0.7	$3.8	$12.9	3%
Line Item Construction	$1.3	$1.5	$0.5	$0.5	$1.2	$5.9	$11.0	2%
Other NPS Programs	$3.5	$3.1	$0.0	$0.1	$0.2	$4.1	$11.1	2%
Title 16 Fee	$9.8	$10.3	$17.7	$1.5	$4.9	$4.7	$48.7	10%
Recreation Fee	$9.7	$10.1	$3.6	$1.3	$4.7	$3.7	$32.9	7%
Transportation Fee			$13.4				$13.4	3%
Concessions Franchise Fees	$0.1	$0.2	$0.7	$0.2	$0.3	$1.0	$2.4	1%
Title 23	$194.0	$15.0	$7.2	$26.1	$5.8	$27.3	$275.3	59%
FLTP	$170.1	$5.2	$4.9	$25.4	$4.7	$12.6	$222.8	48%
Earmarks	$13.3	$3.5	$0.9		$0.7	$6.6	$25.0	5%
PLH-D	$4.2	$4.4	$1.0	$0.5	$0.3	$3.2	$13.7	3%
Scenic Byways	$0.6	$0.1			$0.0	$0.8	$1.6	0%
Trans. Enhancements		$1.0					$1.1	0%
Other FHWA Programs	$5.7	$0.8	$0.5	$0.1	$0.1	$3.9	$11.1	3%
Other/External	$1.0	$4.3	$4.9	$0.2	$0.3	$9.3	$20.0	4%
FTA TRIP/ATPPL		$1.2	$4.0		$0.1	$3.9	$9.2	2%
Reimbursable Agreements	$0.9	$1.4	$0.9	$0.2	$0.1	$5.0	$8.7	2%
Donations	$0.1	$1.7	$0.0	$0.0	$0.0	$0.2	$2.1	0%
Grand Total	$270.9	$53.0	$33.1	$32.0	$14.3	$65.3	$468.5	100%

Source: NPS Administrative Finance System

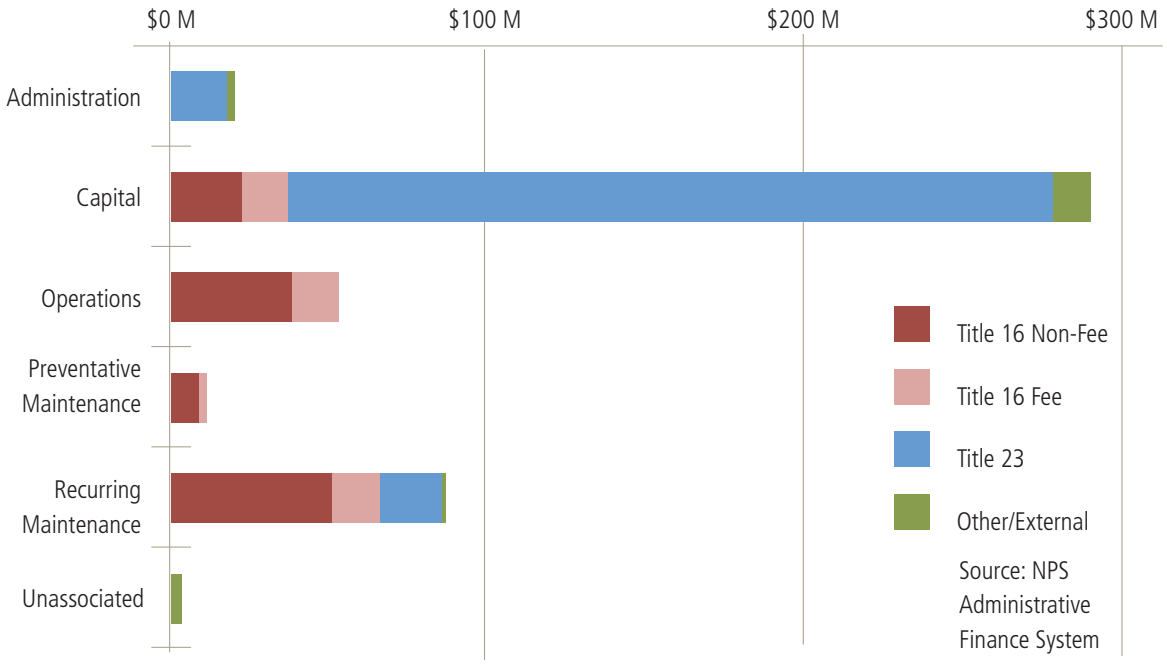
Obligations by Asset Lifecycle Stage

Total cost of facility ownership is a concept that recognizes that assets require investment throughout their entire lifecycles. By investing in regular operations and maintenance activities, facility managers can increase the service life of assets and minimize the total cost of facility ownership. The National Park Service tracks spending by stages in the asset lifecycle:

- Planning and administration includes identify challenges, needs, and alternative solutions prior to implementing a solution.
- Capital includes investments in new and replacement assets.
- Operations constitutes activities that ensure the day-to-day operation of transportation systems (e.g., plowing, transit operations, mowing, etc.).
- Preventative maintenance constitutes maintenance tasks performed at least annually (e.g., cleaning culverts, inspections, vegetation control, etc.).
- Recurring maintenance constitutes maintenance tasks performed on a cycle of 1–10 years (e.g., chip seals, mill and overlays, restriping, etc.).

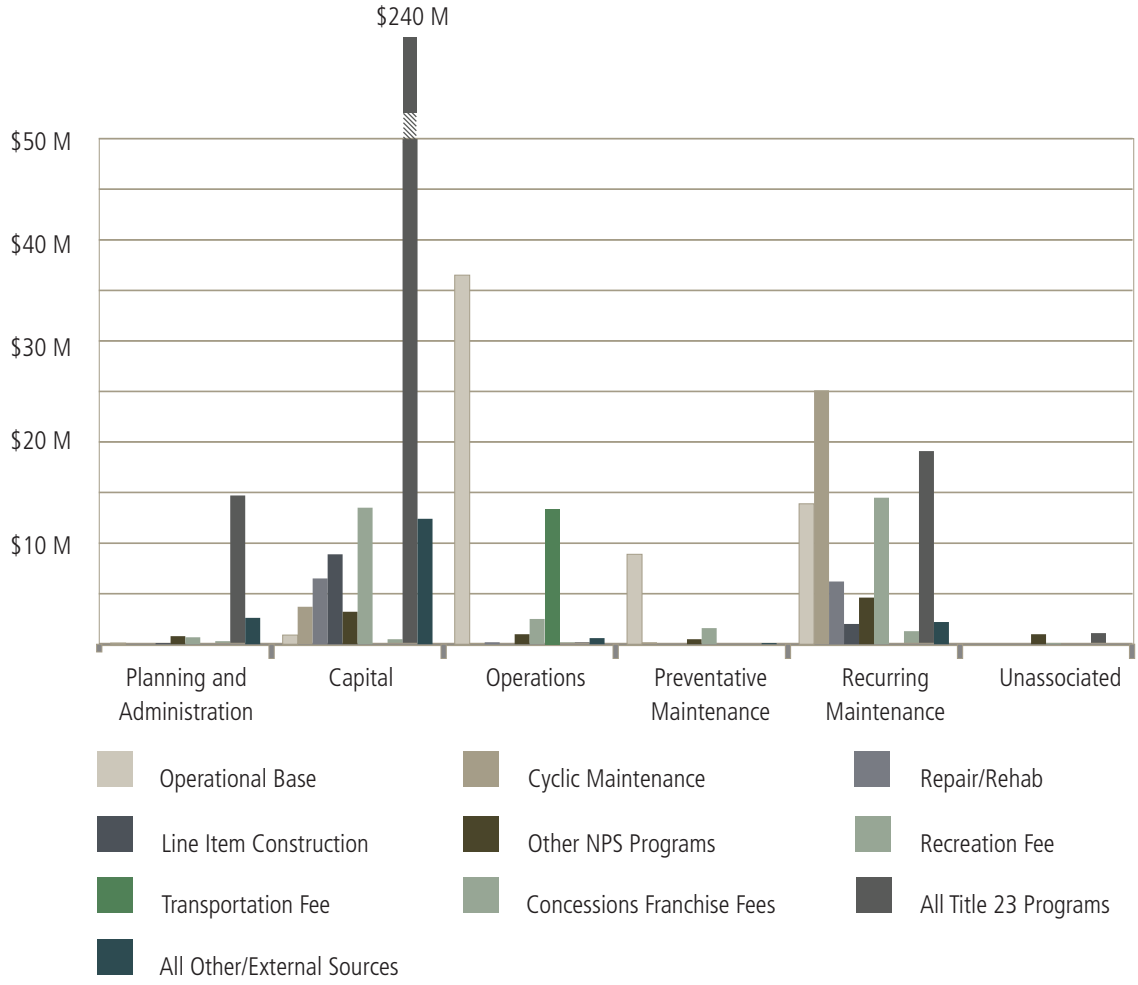
Figure 15 shows average annual spending by title and by lifecycle stage. Capital spending accounted for 62% of annual obligations. These obligations largely funded heavy "3R" (resurfacing, restoration, and rehabilitation) work on paved roads that required special expertise and equipment. Eighty-three percent of capital investments were made using Title 23 fund sources.

Figure 15. Average Annual Investments by Lifecycle Stages and Funding Title, FY2006-FY2012.



Spending for maintenance was a distant second, followed by operations. Historically the National Park Service paid for 86% of operations and maintenance activities using Title 16 fund sources. Preventative maintenance activities, which can typically be accomplished with unit staff and equipment, were typically the responsibility of the unit-controlled Park Base Operations and Transportation Fees, shown in figure 16.

Figure 16. Title 16 spending by fund program and asset life cycle, FY2006–FY2012.



Source: NPS Administrative Finance System

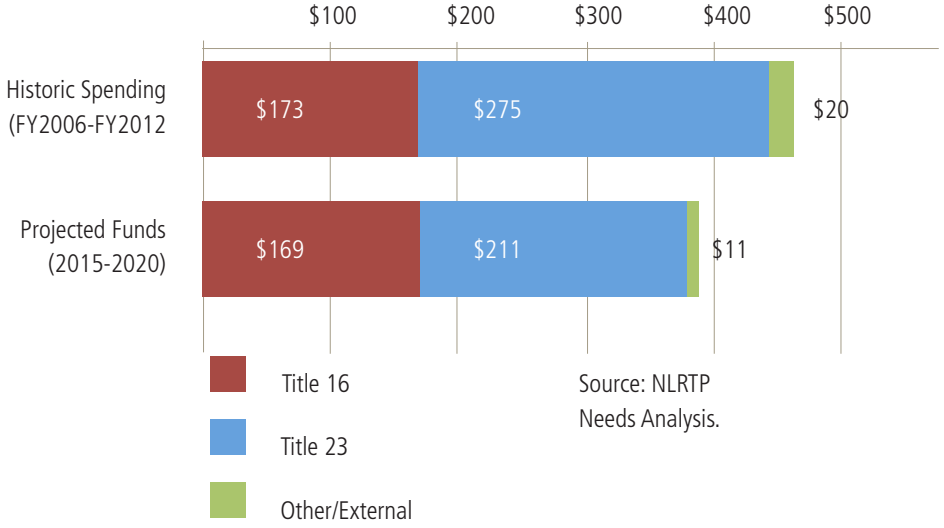
Assigning national and regional fund sources (such as FLTP and Cyclic Maintenance) responsibility for capital investments and unit-controlled fund sources (such as Park Base Operations and Transportation Fees) responsibility for operations and preventative maintenance has led to suboptimal investment patterns that fail to optimize total cost of facility ownership or maximize service life of assets. Units sought capital and heavy maintenance funding mostly from Title 23 but also from Title 16 fund sources controlled by the regions and headquarters. But the units did not have the funding from Park Base Operations or Transportation Fees necessary to perform regular maintenance on improved assets, and assets deteriorated more quickly than they should have.

The National Park Service has begun implementing the Capital Investment Strategy to align spending among different funding programs and levels of the organization. The Capital Investment Strategy requires units to commit to minimum levels of preventative maintenance for highest and high priority assets. The Capital Investment Strategy then aligns funding capital and preventative maintenance investments by focusing capital investments on highest and high priority assets.

Forecasted Funding

Forecasted transportation funding for the next five years is estimated to be $391 million per year, a decrease of $78 million, or 17%, from the historical annual average of $469 million, shown in figure 17. Rationales for forecasted funding, shown in table 7, are based on past funding availability, current transportation legislation, conversations with NPS managers, and examination of proposed transportation legislation.

Figure 17. Comparison of Annual Historic Spending (FY2006–FY2012) and Annual Forecasted Funding (FY2015–FY2020).



Source: Administrative Finance System, NPS Washington Support Office

Table 7. Rationale of Average Annual Forecasted Funding (FY2015–FY2020).

Fund Source	Historical	Forecasted	Difference	Rationale
Title 16	$173.2	$169.5	-$3.7	
Title 16 Non-Fee	$124.5	$120.7	-$3.7	3% single-year reduction per NPS Budget Office
Title 16 Fee	$48.7	$48.7	$0.0	Visitation, policies, and authorizations remain constant
Title 23*	$275.3	$211.0	-$64.3	FLTP remains flat and discretionary programs remain eliminated
Other/External	$20.0	$10.8	-$9.2	TRIP remains eliminated in future transportation legislation
Grand Total	$468.5	$391.3	-$77.3	

Source: Administrative Finance System, NPS Budget Office, NPS Park Facility Management Division

*Less FLTP rescissions and takedowns

The decrease in transportation funding is significant and requires the National Park Service to further develop and implement wise spending strategies. Yet even the historical funding was less than what the National Park Service needed to maintain the transportation system in good condition, protect America's irreplaceable natural and cultural resources, and provide safe and comfortable access to visitors.

Needs and Gaps

The National Park Service estimates its annual, unconstrained transportation funding need across all lifecycle stages to be $1.38 billion. Based on forecasted funding of $391 million and a resulting annual funding gap of $993 million, the National Park Service expects decreases in asset condition and increases in deferred maintenance and unmet programmatic needs, as shown in table 8.

Deferred maintenance needs, introduced on page 24 of the "Facility Management" chapter, are recurring maintenance or replacement needs that are unmet or past due. Programmatic needs address legal and policy requirements to improve safety, comply with building codes, meet accessibility requirements, and reduce environmental impacts.

Table 8. 20-Year Outcomes of Unconstrained and Constrained Funding Scenarios.

	Current Conditions	Funding Level Equivalent to Unconstrained Needs, $1.38 billion/yr	Funding Level Equivalent to Forecasted Funding, $391 million/yr
Condition	82 PCR	85 PCR	78 PCR
Roads & Parking*	92 BHI	92 BHI	90 BHI
Bridges**	0.191 FCI	0.000 FCI	0.267 FCI
Non-paved Assets***			
Deferred Maintenance			
Roads & Parking	$5.3 billion	$2.0 billion	$3.5 billion
Bridges	$0.4 billion	$?.? billion	$?.? billion
Non-paved assets	$1.8 billion	$0.0 billion	$2.0 billion
Total	$7.0 billion	$?.? billion	$?.? billion
Programmatic Needs			
Non-paved assets	$249 million	$0	$129 million

Sources: Reauthorization Resource Paper, PFMD Deferred Maintenance Model

* Pavement Condition Rating

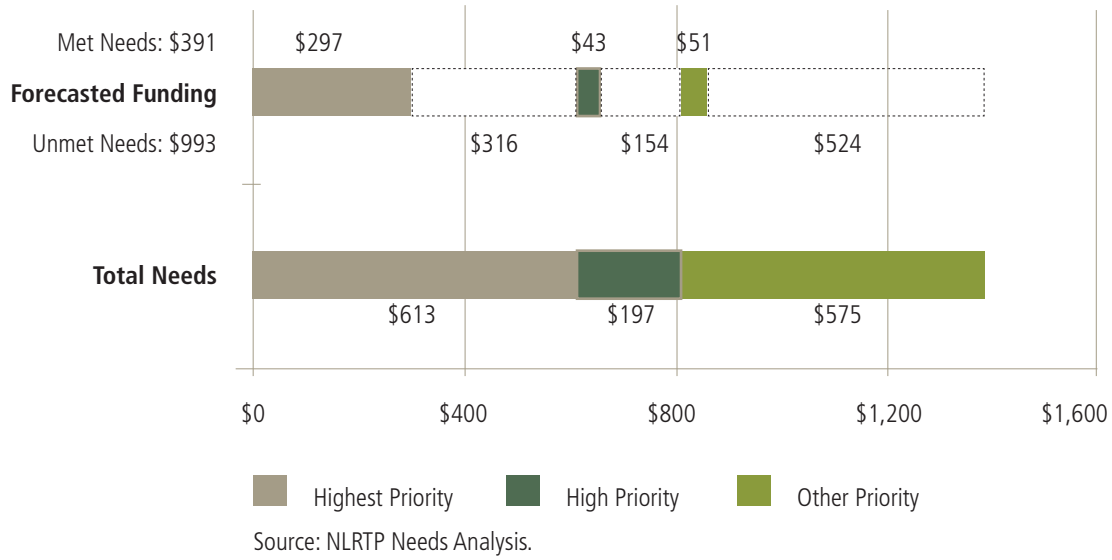
** Bridge Health Index

*** Facility Condition Index

This long-range transportation plan analyzes the gap between forecasted funding and unconstrained needs assuming forecasted funding is allocated to investment needs according to historical spending patterns across priorities, asset categories, and lifecycle stages, with one exception: the National Park Service is committed to more than doubling its current investment level in bridges to $35 million.

Forty-four percent of needs totaling $613 million are attributed to highest priority assets and services, as shown in figure 18. Even if all $391 million of forecasted funding were applied to highest priority needs, the National Park Service would still be more than $200 million short of meeting those needs each year.

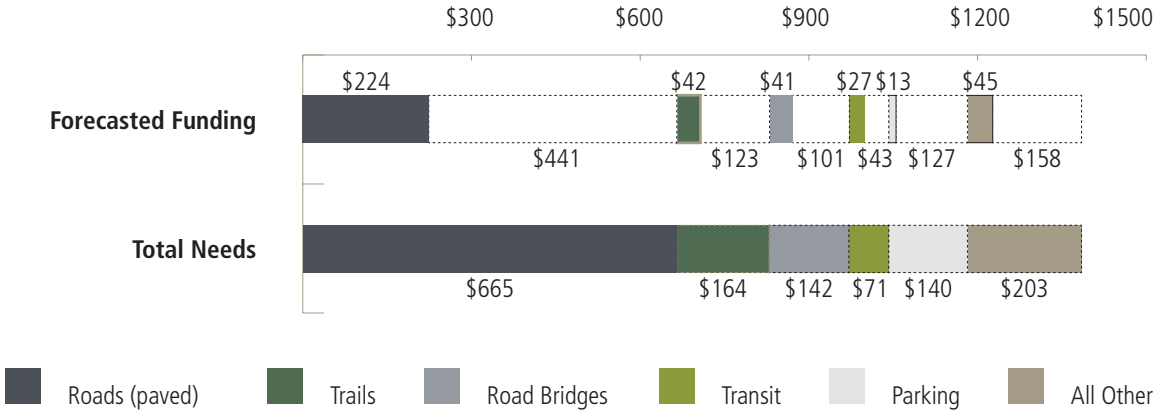
Figure 18. Total Annual Needs and Gaps by Priority.



Source: NLRTP Needs Analysis.

Figure 19 shows needs in the context of asset categories. Roads, trails, bridges, transit, and marinas continue to be the assets having the greatest needs, although as mentioned above, the National Park Service plans to increase spending on bridges, primarily at the expense of roads. Investing forecasted funding using historical spending patterns will not fully fund any one asset category.

Figure 19. Total Annual Needs and Gaps by Asset Category.

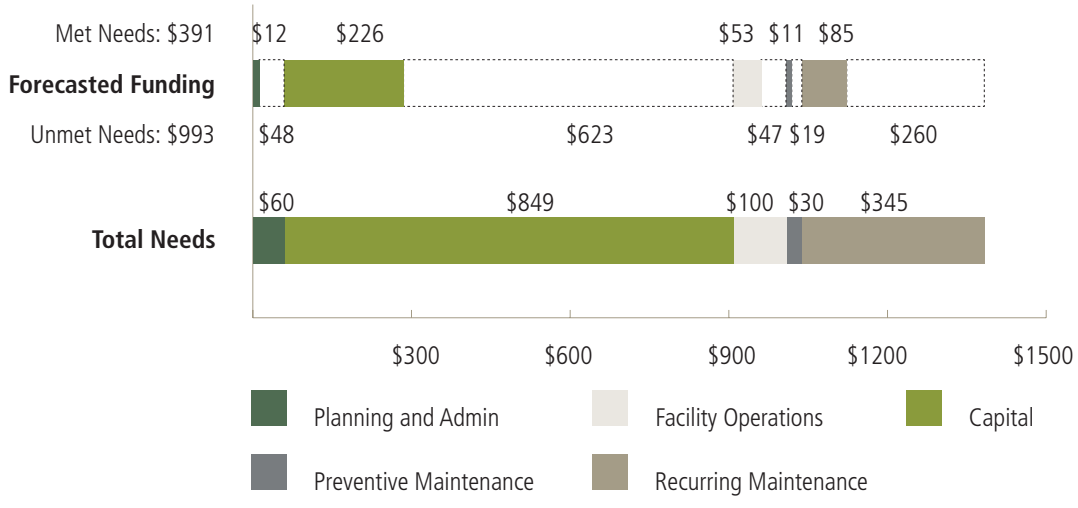


Source: NLRTP Needs Analysis.

Adams National Historical Park

No single asset lifecycle stage would be funded adequately, as shown in figure 20, though the gaps for operations and preventative maintenance deserve particular attention. As discussed above, the National Park Service has traditionally under-invested in operations and preventative maintenance, resulting in continued accrual of deferred maintenance, even after substandard facilities are improved. Unless responsibility for operations and preventative maintenance are broadened beyond unit decision makers, units will require a combined $66 million from Park Base Operations and/or fee programs to operate and take care of capital investments as required by the Capital Investment Strategy.

Figure 20: Total Annual Needs and Gaps by Asset Lifecycle Stage.



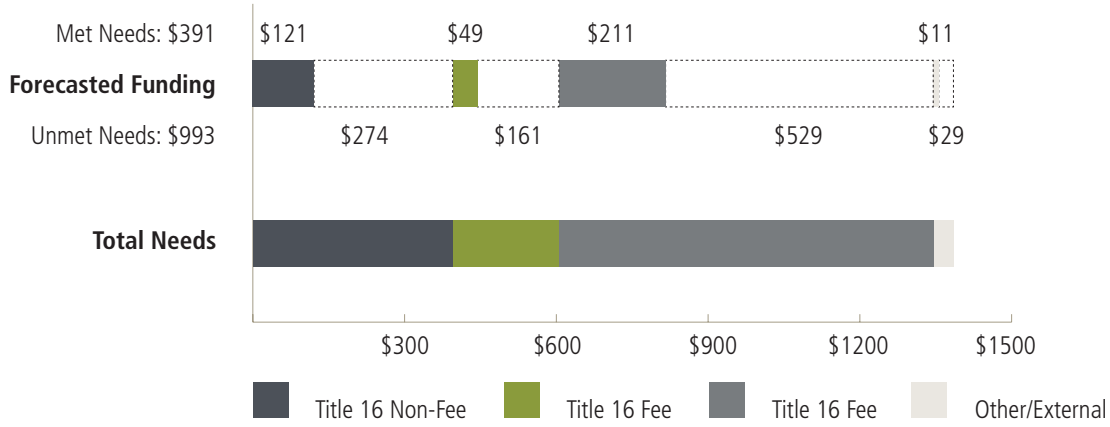
Source: NLRTP Needs Analysis.

The National Park Service Underinvests in Roads Operations and Maintenance

An analysis of national parks found that parks plan to spend roughly 50% to 75% of what is required to maintain paved roads in good condition, or $3,000 to $4,500 per lane mile compared with $6,000 per lane-mile (NPS 2013f). In comparison, the Federal Highway Administration estimates state departments of transportation invest between $5,000 and $10,000 per lane mile (excluding surface overlays, chip seal, or deep base repairs that would normally be covered during major surface rehabilitation projects), roughly 90% of estimated requirements of between $5,600 and $11,000 (USDOT Volpe Center 2012; FHWA 2014). The National Park Service invests less in road operations and maintenance, both in actual dollars and as a percentage of requirements, than its state counterparts.

If future investment needs are paid for with funding sources using historical spending patterns, the needs from authorizing titles each would at least triple, as shown in figure 21. Title 16 Fee needs would have to quadruple, either by raising fees or imposing fees at more parks. Title 16 Non-Fee needs alone are roughly the same as the entire forecasted funding for NPS transportation.

Figure 21. Estimated Needs and Gaps by Funding Title (in Millions).



Source: NLRTP Needs Analysis.

Transportation funding needs may also be considered from three additional, perspectives: large-scale projects that are currently beyond the capacity of core programs to address, deferred maintenance, and programmatic needs

Large-scale Projects

Of the $1.38 billion in annual need, $200 million per year comprises large-scale projects that are currently beyond the capacity of core Title 23 and Title 16 fund programs to accomplish. These large-scale projects are mission and safety-driven and include, for example, repair and construction of the Arlington Memorial Bridge, completing the "missing link" of the Foothills Parkway, and completion of the Anacostia Riverwalk Trail. Attempting to complete large-scale projects with only forecasted funding of $391 million could severely disrupt spending on ongoing maintenance and deferred maintenance and grow the transportation deferred maintenance level beyond its already unsustainable level.

Deferred Maintenance

Existing deferred maintenance for transportation assets is $7.5 billion. If all ongoing maintenance needs, shown in figure 8 were met on time, deferred maintenance would not grow, and the National Park Service would eliminate deferred maintenance in a 20-year period with $375 million of the annual $1.38 billion. Under this unlikely scenario, $313 million would pay down deferred maintenance of paved roads and bridges, and $62 million would address all other assets.

Programmatic Needs

The National Park Service has a $760 million backlog of programmatic needs that address legal and policy requirements to improve safety, comply with building codes, meet accessibility requirements, and reduce environmental impacts. Thirty-eight million dollars of the annual $1.38 billion would reduce transportation programmatic needs for nonpaved assets to $0. Under forecasted funding levels, however, deferred maintenance and programmatic needs will grow. The "Investment Strategies" chapter further explores outcomes of four alternative spending patterns and suggests how condition, deferred maintenance and programmatic needs may strategically be addressed.

Acadia National Park (c) David Brossard

Meeting Transportation Objectives

Objective: Identify and prioritize investments based on agency mission, anticipated lifecycle costs, and consideration of likely available future funding.

The National Park Service faces declining funding for transportation. At the same time, the deferred maintenance backlog is increasing and pressing programmatic needs remain unmet. To begin addressing these challenges, the National Park Service developed the Capital Investment Strategy to focus NPS spending on its highest priority facilities and services and align capital investments with operations and maintenance investments.

At the time of writing, the Capital Investment Strategy has been incorporated into the programming process of several funding programs, yet opportunities remain to implement it consistently across all NPS transportation funding programs and asset categories. Doing so will allow decision makers to program funding based on unit priorities, rather than by mode.

There is empirical evidence that unit and regional/national priorities are not aligned. The National Park Service has designed the Capital Investment Strategy to align investment decisions, but with the funding forecasted, units will not have the funding required to adequately maintain capital investments. Activities such as crack sealing and joint repair, light brushing, culvert cleaning, and other light road maintenance activities can increase expected service life and actually reduce the total cost of facility ownership. A relatively modest increase in preventative maintenance from $11 million to $30 million per year (out of a total annual $391 million) would fulfill all currently identified NPS transportation preventative maintenance needs and allow the National Park Service to maintain its roads at the same level as state departments of transportation.

Finally, the National Park Service can seek to close the gap between available funding and needs by examining both revenue sources and costs. By actively expanding partnerships with state and local governments, the National Park Service will improve regional planning and may gain access to nontraditional funding sources such as the Highway Safety Improvement Program, Federal Transit Administration Formula Grants for Urbanized and Rural Areas, the Congestion Mitigation and Air Quality Program, and others. To reduce transportation costs, the National Park Service should systematically seek to dispose of low priority facilities and services and redirect funding to those of higher priority.

Recommended Strategies:

- Implement the Capital Investment Strategy consistently across all transportation fund sources.
- Fully fund transportation preventative maintenance needs and clearly articulate the benefits.
- Seek out new transportation planning partners and funding sources.
- Dispose of lowest-priority transportation assets.

Objective: Maintain flexible use of transportation funding sources while improving identification of transportation obligations and needs.

It is widely held by state departments of transportation and the transportation industry at large that due to the scale of investments and the often lengthy timelines of projects, transportation benefits from dedicated funding levels that are predictable and sustainable. The FLTP provides a dedicated fund source for roughly 50% of NPS transportation obligations. The remaining 50% comes from more than 60 fund programs, including multiple fee programs, discretionary programs administered by the U.S. Department of Transportation, and NPS discretionary programs that are not specific to transportation and are administered by offices at all levels of the agency. Transportation, which represents 45% of the value of the asset portfolio and 67% of deferred maintenance, competes with all other NPS emphasis areas for these programs.

Beyond the National Park Service's capable management of FLTP and use of the Capital Investment Strategy to align maintenance and capital investments, there is an opportunity to coordinate transportation investments among the largest fund programs including FLTP, Cyclic Maintenance, Repair Rehab, Line Item Construction, Fee programs, and others. Consistent, reliable, and targeted coordination of funding would ensure that transportation receives the funding it needs, when and where it is needed in order to reduce the total cost of facility ownership.

The investment strategies presented in this plan suggest alternative ways in which transportation funding might be directed to address needs. Such changes would require evaluating assumptions, cultural attitudes, policies, and fund program eligibility criteria. Good data will be needed to explore these ideas and facilitate future transportation finance analyses. Currently, transportation assets are not identified as such in the Federal and Business Management System (FBMS), not all transportation assets are in FBMS, FBMS cannot associate obligations with specific assets, and there is no system of record for planned maintenance spending. Addressing data issues and improving information systems will enable faster, more timely reporting, and more meaningful financial analyses.

Recommended Strategies:

- Improve coordination of transportation investments across multiple funding programs, in keeping with the CIS emphasis on highest priority facilities and services.
- Identify transportation assets in FBMS, and incorporate NPS transit systems into FBMS.
- Associate obligations with specific transportation assets in the NPS financial system.
- Create a system of record for planned maintenance spending.

Golden Gate National Recreation Area (c) Frank Schulenburg

Measuring Performance

Performance Measure: Reduction in deferred maintenance on highest priority transportation assets.

A Call to Action Goal 24 seeks to reduce deferred maintenance and the Capital Investment Strategy seeks to target investment on highest priority assets. These strategies have been designed to ensure the National Park Service's most important assets and services are taken care of first.

The target for this performance measure is pending plan review.

Performance Measure: Percent of transportation funds obligated on highest-priority transportation assets.

This performance measure extends the NPS focus beyond deferred maintenance to all investments in highest priority transportation assets and services.

The target for this performance measure is 75%.

Performance Measure: Percentage of units that are able to meet 55% of preventative maintenance targets on highest priority transportation assets.

This performance measure tracks how well units are able to meet ongoing maintenance commitments on highest priority assets, in support of the Capital Investment Strategy.

The targets for this performance measure are as follows:

- 20% of units in year one
- 40% in year two
- 60% in year three
- 80% in year four
- 100% in year five and subsequent years

Resource Protection Objectives

-Incorporate natural and cultural resource protection considerations into all aspects of transportation decision-making and operations to avoid, minimize, or mitigate negative impacts on these resources.

-Minimize and mitigate the greenhouse gas emissions of the NPS transportation system.

Blue Ridge Parkway

Resource Protection

Goal: Protect and preserve natural and cultural resources

The national park system is home to unparalleled natural and cultural resources of great importance to the nation and increasingly, the international community. While many National Park Service units have unique legal authorization to protect specific and varied resources, all parks share a common mission to conserve resources and to provide for their public enjoyment in a way that will leave them unimpaired for the enjoyment of future generations. The NPS transportation system plays a critical role in providing public access to and within parks, but can also pose potential threats to the quality and integrity of sensitive resources and ecosystems within and adjacent to NPS areas. As such, the NPS transportation system must be considerate of the irreplaceable nature of the surrounding natural and cultural resources. NPS Management Policies 2006 emphasizes that "when there is a conflict between conserving resources and values and providing for enjoyment of them, conservation is to be predominant (§1.4.3)."

The National Park Service is committed to using context-sensitive design and management practices to address negative impacts on natural and cultural resources and to reduce contributions to climate change from greenhouse gas (GHG) emissions, as caused by its transportation systems and users.

By the time the National Historic Preservation Act of 1966 and National Environmental Policy Act of 1970 regulations went into effect, 245 NPS units had already been established. The transportation facilities in these parks were designed prior to modern historic preservation and environmental planning practices at a time when resource impacts may not have been fully considered or analyzed. The maintenance and operation of these legacy transportation systems can perpetuate impacts on mission-critical natural and cultural resources.

This chapter addresses some of the primary areas in which transportation infrastructure impacts the quality and integrity of the natural and cultural resources that the National Park Service is charged with protecting. The chapter also addresses the role that the NPS transportation system plays in the agency's greenhouse gas emissions.

Glacier Bay National Park and Preserve

Baseline Conditions & Macro Trends

Natural Resource Stewardship

The national park system encompasses a broad range of ecosystems and habitats, from the alpine tundra of the Rocky Mountains and vast desert canyons of the southwest, to pristine shorelines along the Atlantic, Pacific, Gulf, and Great Lakes coasts, to the waters of Glacier Bay and Biscayne Bay. The diversity of life and ecosystems in the system makes it challenging to quantify resource impacts caused by transportation systems and users across parks and regions.

The National Park Service collects a great deal of natural resource data that can be used to inform management decisions. The NPS Inventory and Monitoring Program provides guidance and standards for data collection and integration of natural resource data into planning, management, and decision making. In addition to internal efforts, the National Park Service also works with the Federal Highway Administration and others to collect data and information that can inform resource issues related to transportation planning and operations. While the National Park Service has extensive natural resource inventories, specific data on the resource impacts from transportation within the NPS system is limited. NPS units exist in a matrix of other land uses and activities, so in many cases data on resource impacts and improvements cannot be isolated from the confounding influences of the surrounding environment.

Despite the challenges with quantifying the transportation-specific impacts on NPS resources, there are several key issues where the transportation impacts on natural resources can be identified and classified as servicewide issues. These issues, which are addressed in this section, include degraded air quality, habitat fragmentation and wildlife-vehicle collisions, spread of invasive species, noise, artificial light, geologic hazards, degraded water resources, and erosion.

Air Quality and Scenic Views

Air pollution, even in relatively low levels, affects ecological health, scenic views, visitor experience, and human health. Motorized transportation use, on both paved and unpaved roads, and visitation are directly linked to air quality in parks. Highway vehicles, off-highway vehicles, marine engines, aircraft engines, and other motorized vehicles all contribute to air pollution in gaseous and particulate form. The Environmental Protection Agency (EPA) has established national ambient air quality standards (NAAQS) for ground level ozone and other air pollutants. Areas that fail to achieve these standards are classified as nonattainment areas. Once a nonattainment area achieves the NAAQS standards, they are put into a "maintenance" classification and must maintain good air quality for 25 years.

As of 2012, 70 NPS units were located in ozone nonattainment areas and 37 were in particulate matter nonattainment areas. These units are generally located near or downwind from urban or industrial areas. When NPS units fall within a nonattainment area, all proposed transportation and road construction projects must go through an evaluation to assess whether the activity would contribute to air quality violations or delay attainment of air quality standards. States with "nonattainment" and "maintenance" areas are eligible to receive Congestion Mitigation and Air Quality federal funding to help implement initiatives aimed at improving air quality. While the National Park Service strives to improve the air quality of its units, the regional nature of air quality issues creates challenges in doing so. Because ozone and particulate matter are regional pollutants, their origin and atmospheric movement are often beyond the control of park managers.

Air pollution can also limit the scenic views at units. Degradations in visibility affect how far and how well visitors can see from scenic outlooks. In addition to air pollution from regional sources, some roads run through soils sensitive to wind erosion and result in dust generation. This dust also impacts air quality through the introduction of particulate matter.

Arches National Park © Dave Beedon

Acoustic Environment and Soundscapes

Natural sounds are vital to the natural functioning of park ecosystems and are important for many reasons including intra-species communication, predation and predator avoidance, and effective use of habitat. Transportation is a major contributor to changes in the acoustic environment of a park setting through introduction of anthropogenic sounds, which have the most pervasive impact on acoustic resources in parks. Congestion and pavement smoothness can greatly impact the amount of noise that automobile traffic generates. The NPS Natural Sounds and Night Skies Division has developed guidance on minimizing noise impacts from transportation, such as the use of quiet pavement technology, lower speed limits, and soundscape outreach.

Night Sky Resources

The quality of the nighttime environment is relevant to nearly every unit in the NPS system, due to its importance in ecosystem functions, wilderness character, and aesthetics. Since 2001 the National Park Service has systematically inventoried night sky quality in approximately 100 parks. The data show that nearly every park measured exhibits some degree of light pollution. Transportation is a major contributor to light pollution. Vehicle headlights and artificially lit parking lots, roads, and other transportation fixtures can impact the natural lightscape and negatively affect wildlife. Artificial lighting from transportation systems and users can often be seen for many miles.

Everglades National Park

Habitat Fragmentation and Wildlife-Vehicle Collisions

Roadways and other transportation systems present a significant barrier to movement for many aquatic and terrestrial species, which generates multiple adverse and compounding ecological impacts, particularly on threatened and endangered species. When habitat areas are bisected by a roadway, abrupt edge conditions are created which can lead to road avoidance behaviors by wildlife and loss of diversity within a given population of species. The National Park Service uses best management practices to help minimize transportation impacts on wildlife, including incorporating design features, such as culverts or bridges that allow for aquatic passage and wildlife crossings, and resource management best practices, such as closing roads during breeding times.

Wildlife-vehicle collisions present a direct and measurable impact of transportation on park resources. Some species may be faced with a serious reduction in population survival probability as a result of wildlife-vehicle collisions alone. Populations of threatened or endangered species, wide-ranging species, and migratory species are especially vulnerable to road mortality. A review of federally listed threatened and endangered species identified 21 species for which direct road mortality is among the major threats to the survival of the species in the United States (Huijser et al. 2008) (see table 9). These species are currently found within 32 parks (NPS 2005). Many other species, including additional threatened or endangered species, are also risk fatalities as a result of conflicts with vehicles.

Table 9: Threatened and Endangered Species at Risk as a Result of Road Mortality

Mammals	Lower Keys marsh rabbit, Key deer, bighorn sheep (peninsular California), San Joaquin kit fox, Canada lynx, ocelot, Florida panther, red wolf
Reptiles	American crocodile, desert tortoise, gopher tortoise, Alabama red-bellied turtle, bog turtle, copperbelly water snake, eastern indigo snake
Amphibians	California tiger salamander, flatwoods salamander, Houston toad
Birds	Audubon's crested caracara, Hawaiian goose, Florida scrub jay

The National Park Service collects limited data on wildlife-vehicle collisions as part of its servicewide crash data. At a minimum, the National Park Service collects data on whether or not reported accidents involved a "collision with animal." In some cases, more-detailed information including the species involved is recorded. The total number of wildlife-vehicle collisions is probably underreported because many collisions involving small animals do not cause property damage or human injury and therefore are not reported by visitors. In addition, an unspecified number and diversity of species, large and small, leave the roadway before dying and thus go uncounted.

Although the National Park Service does not systematically collect data on road-related mortality to wildlife, a 2007 servicewide survey of resource managers indicates that road-caused mortality significantly affects wildlife populations within NPS units (Ament et al. 2008). In addition, the most recent available NPS crash data indicate the National Park Service experiences a higher rate of crashes involving wildlife as compared to all public roadways nationally. From 1990 to 2005, wildlife-vehicle collisions were the leading cause of single-vehicle crashes in the NPS system and accounted for 10% of total vehicle crashes, which was more than double the 4.6% national average (NPS 2009, Huijser et al. 2008). Wildlife-vehicle collisions were the most common crash type in the Intermountain, Northeast, and Southeast Regions (NPS 2009).

Despite expressed concerns of park resource managers, only one-third of NPS units employ some form of mitigation to reduce road impacts on wildlife (Ament et al. 2008). This relatively low rate of implementation reflects the reality that the efficacy of any implementation strategy is dependent upon the context of the site and area. Another deterring factor is the availability of funding to establish and maintain the mitigation strategy. The most common mitigation techniques currently in use within NPS units include the use of wildlife signs, speed reduction, and public education. Other mitigation measures such as wildlife crossings and associated fencing have been installed along non-NPS roads traversing national parks with high traffic densities such as Big Cypress National Preserve and Glacier National Park. To date, wildlife crossings have not been installed on NPS-managed roads. Although often the most costly solution initially, wildlife crossings may reduce long-term operational costs for the National Park Service.

Capulin Volcano National Monument

Vegetation Management

Vegetation management is a common natural resource component of NPS transportation projects and maintenance activities. Vegetation management includes activities such as roadside mowing, tree trimming, hazardous tree clearing, wildland fire management, and controlling invasive species. These types of maintenance activities support healthy ecosystems and improve safety conditions.

Vegetation management is also a component of many transportation construction projects. Prior to construction, mature or sensitive vegetation can be transplanted to other areas of park units. Following construction activities, revegetation is almost always necessary. Movement and staging of heavy construction equipment disturbs soils and tears up vegetation. The National Park Service uses best management practices for roadside vegetation management, such as cleaning equipment, minimizing soil movement, and selecting appropriate plant species to support natural ecosystems, limit the spread of invasive species, reduce erosion, and decrease demand on storm water drainage systems.

Geologic Resources

The National Park Service recognizes the importance of protecting geologic resources in the context of transportation decision-making. These resources include a variety of natural landforms such as canyons and valleys, unique rock formations, dunes, caves and karst systems, fossils and other paleontological resources, volcanoes, geothermal features, shorelines, glacial features, mineral deposits, and abandoned mineral lands. Roadways and transportation modifications in coastal zones, particularly those along coastal shorelines, are of significant concern as they are increasingly prone to natural geologic incidences and may actually increase the impact of these types of incidences. These transportation-related modifications may alter or prevent the natural movement of sediment along coastlines and increase the vulnerability to extreme weather events.

Water Resources and Erosion

Transportation system impacts on water resources are pervasive throughout the National Park Service. The surface transportation system impacts water resources in many ways, including surface water flow modification, groundwater flow modification, water quality degradation, degradation or loss of wetlands, drainage, and impacts on aquatic organisms. Similarly, aquatic transportation systems can also impact water resources through habitat modification, introduction of invasive species, and water quality degradation.

Wetlands mitigation can be a significant component of NPS transportation construction activities because many transportation facilities are sited next to rivers, streams, lakes, coasts, and other wetlands. The National Park Service has a "no net loss of wetlands" policy, meaning if construction within or adjacent to a wetland cannot be avoided by any practicable alternative any disturbed areas must be reclaimed (NPS 2006). Additionally, the agency is directed by management policies to restore previously degraded or destroyed wetlands for a long-term net gain of wetlands across the system (NPS 2006).

Erosion is another significant issue impacting water resources, particularly in terms of culverts and bridges, where heavy precipitation can lead to scouring and the transport of sediments. The resultant influx of sediments into a waterway can degrade water quality, and erosion can also create safety concerns for bridges. In some cases, erosion control measures are necessary to protect roadways that run alongside waterways, where banks and retaining walls are in constant danger of being undermined. Erosion control measures such as clearing roadside drains and ditches and fixing or replacing culverts are incorporated into a large number of transportation projects.

Natural Resource Considerations in Transportation Projects

The National Park Service is currently developing the Innovative and Sustainable Transportation Evaluation Process and Guidance (INSTEP) process for planning, design, construction, operations, and maintenance of transportation facilities and systems. The INSTEP process will involve scoring new transportation projects at various phases of a project, ranging from planning and pre-design to construction and operations, in order to rate the project's ability to avoid, minimize, or mitigate negative environmental impacts caused by facilities and users. The score will help inform decision-making for opportunities to create more sustainable transportation facilities and operations and increase awareness of opportunities to incorporate innovative strategies. In addition, through the collection of data and scores, the INSTEP process will allow for a long-term performance-based database with project-level data that can be used to inform cost/benefit discussions, provide a source of best practices and sustainability guidance, and allow the National Park Service a greater ability to monitor resource conditions identified in projects over a period of time.

Cuyahoga Valley National Park

Cultural Resource Stewardship

NPS properties preserve a fundamental link between the past and present, and access to these resources ensures that individuals can learn about and appreciate their own history and the American story. Many NPS transportation assets are themselves cultural resources to be enjoyed by park visitors. These include national parkways; national scenic byways; national historic trails; and national historic civil engineering landmarks. These assets may be culturally significant due to their age, architectural or engineering significance, historical role, or designation.

Culturally significant transportation assets are, by definition, different from standard parts of the NPS transportation system. These culturally significant transportation assets have an unusual dual role as both functional infrastructure and cultural resources. Most NPS culturally significant transportation assets are in active use, and, in some cases, are among the most used or heavily traveled parts of the NPS transportation network. The National Park Service has a mission to preserve the qualities that make cultural transportation assets significant, while in many cases still maintaining and accommodating their enduring transportation function. Although this mandate is well documented in the National Park Service Organic Act and in the bureau's policies and guidance, the National Park Service does not have a comprehensive list of best practices for achieving this balance for projects and plans.

The relationship between cultural resources and the transportation system are not limited to transportation assets themselves. There are several other cultural resource types that both affect the NPS transportation system, and are affected by the system as well. These include ethnographic resources, archeological resources, historic landscapes, and United Nations Educational, Scientific and Cultural Organization World Heritage Sites. Due to the importance of cultural resources to the National Park Service, all transportation decisions should consider possible impacts to such resources.

Identification of Culturally Significant Transportation Assets

The National Park Service maintains inventories for many types of cultural resources, but most of these inventories are only documented at the regional or unit level. Compilation of those data at a national level is often complicated by varying methods of data collection and storage. Cultural resource inventories also are not fully integrated with the asset databases that track facility condition.

The Financial and Business Management System (FBMS) is the system of record for asset management in the National Park Service. This database tracks facility inventory and historic status, and works in conjunction with FMSS to track facility condition and deferred maintenance. FBMS also provides the foundation upon which transportation funding will be prioritized as part of the NPS Capital Investment Strategy (CIS). Per CIS guidelines, the historic status of culturally significant assets, as reported in FBMS, grants them some priority over other assets. As such it is important for these assets to be consistently and correctly categorized in FBMS.

The National Park Service has identified 3,960 culturally significant transportation assets servicewide, approximately 17 percent of all NPS transportation assets. (see table 10).[1] This number is primarily informed by two cultural resource databases—the List of Classified Structures (LCS) and the Cultural Landscape Inventory (CLI). Collectively, these databases comprise the most comprehensive national-level list of culturally significant transportation assets in the park service. The park service has made efforts to ensure consistency between the FBMS and the cultural resource databases, but there have been challenges.

Table 10. Historic Transportation Assets by Asset Category

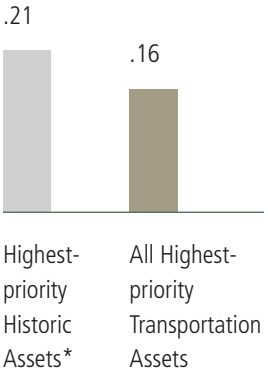
Category	FRP Historic Status	Total NPS Inventory
Roads	1,326	7,855
Parking Area	891	7,998
Road Bridge	844	1,720
Road Tunnel	52	72
Trails	470	2,267
Trail Bridge	97	984
Trail Tunnel	25	40
Buildings	31	277
Fuel	9	472
Constructed Waterways	16	27
Marina/Waterfront	53	998
Aviation System	5	59
Railroad System	141	236
Total	3960	23,005

Source: FMSS data, February 2014

1. These FMSS data are reported by Federal Real Property (FRP) historic status, which includes four resource tiers: (1) National Historic Landmarks (NHL), (2) National Register Listed (NRL), (3) National Register Eligible, and (4) Contributing to an NHL or NRL asset. Each of these tiers is assigned a certain number of points in the CIS, which contribute to its overall funding prioritization.

The primary challenge is that cultural significance/historic status is not tracked to the same degree in both databases. In the FBMS, historic status is only contained at the location level (i.e., a roadway), and not at the asset level (i.e., a feature associated with a location, such as a guardrail). LCS-listed assets that are not associated with an LCS-listed location would not reflect that designation in the FBMS for asset prioritization purposes. For example, a historic stone guardrail (asset level) along a nonhistoric roadway (location level) would not automatically be recognized as having a historic status in the FBMS; that determination resides at the location level only. In addition, the FMSS database does not currently include all cultural landscapes listed in the Cultural Landscape Inventory, but a four-year effort is underway to enter nationally significant cultural landscapes into the FMSS database. Accurate identification of all culturally significant transportation assets in the FBMS is critical for effective CIS prioritization.

Figure 22. Facility Condition Index of Historic Federal Real Property Assets as Compared to All Transportation Assets



Source: FMSS data, February 2014

Condition of Culturally Significant Transportation Assets

The facility condition index (FCI) of the highest-priority historic assets is higher compared to the FCI for all highest-priority transportation assets (see figure 22). This indicates that the highest-priority historic assets are generally in worse condition than the overall asset portfolio. The FCI, which is described in more detail in the facility management chapter of this plan, represents the estimated cost of deferred maintenance (suggested work not performed) divided by the asset's current replacement value. An FCI of 0.08 is equivalent to the transportation industry-standard definition of "Good" condition. In keeping with the overall NPS mission to preserve cultural resources for the enjoyment of this and future generations, these highest priority historic assets should be prioritized for capital improvements and preventative maintenance funding to improve their overall condition.

* Highest priority for cultural resources is defined as historic FRP assets which are also assigned to Optimizer Band 1 and 2, used in Park Asset Management Plans (PAMPs) to prioritize assets for operations and maintenance funding. These criteria are relaxed in comparison to the definition of highest priority for the entire transportation asset portfolio (Band 1 only) to capture those assets that rate highly in terms of cultural significance but which may score lower in other areas.

Climate Change

Greenhouse gas emissions, most notably carbon dioxide (CO2), contribute to the warming of the earth's atmosphere. The warming atmosphere drives global climate change, which has implications both for the resources the National Park Service seeks to protect and the transportation systems that support visitation and other important park functions.

The National Park Service is taking action to address climate change by actively reducing its carbon footprint (volume of GHG emissions) and by raising public awareness on the causes and effects of climate change. In 2010, the National Park Service developed its *Climate Change Response Strategy* (NPS 2010) and an associated *Climate Change Action Plan 2012–2014* (NPS 2012c) which sets the service's goals, objectives, and actions related to climate change science, adaptation, mitigation, and communication. To formally address the GHG mitigation component of the Climate Change Response Strategy, the National Park Service developed the Green Parks Plan in 2012 (NPS 2012b). The Green Parks Plan establishes goals for energy conservation and GHG reductions servicewide.

Transportation Greenhouse Gas Emissions Inventory

The National Park Service estimates and reports GHG emissions in compliance with national standards and as part of required reporting under Executive Order 13514. Emissions are reported in three categories, which describe the degree of control the National Park Service has over the emissions source. The baseline year for GHG emissions tracking and targets is 2008.

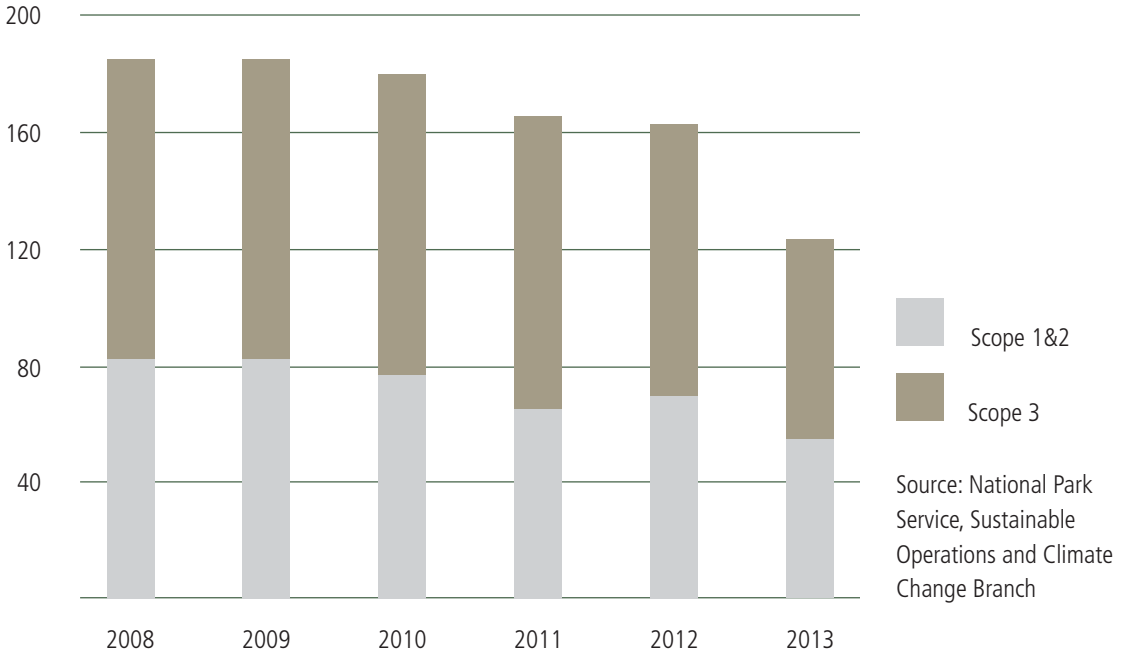
SCOPE 1: Emissions from sources owned or directly controlled by the National Park Service. For transportation, Scope 1 consists of NPS fleet vehicles and equipment.

SCOPE 2: Indirect emissions from purchased electricity and heating, cooling, and steam generation. For transportation, Scope 2 deals only with buildings that primarily serve a transportation system function.

SCOPE 3: Emissions from sources not directly controlled or owned by the National Park Service, but that are attributable to agency activities. For transportation this includes employee travel (business travel and employee commuting).

Overall, NPS transportation sources are responsible for roughly 40% of the National Park Service's GHG emissions, but emissions have declined significantly in the past five years. In 2013, total transportation system emissions were estimated to be 124,000 metric tons of CO2 equivalent ($MTCO_2E$), a reduction of 33% from the 2008 baseline.[1] Scope 1 and 2 emissions accounted for approximately 55,000 $MTCO_2E$, while employee travel (Scope 3) accounted for 69,000 $MTCO_2E$ (see figure 23). Declines from the 2008 baseline were consistent for both Scope 1 and 2 combined and Scope 3.

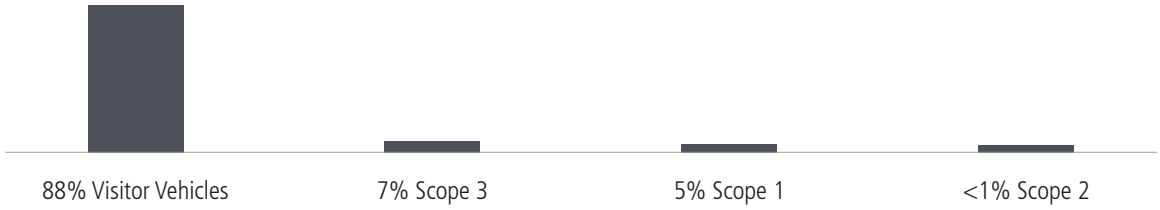
Figure 23. Transportation GHG Emissions Estimates, 2008–2011 (In $MTCO_2E$)



Visitor Vehicle Emissions

In addition to the GHG emissions related to agency activities, visitors generate emissions when they use personal vehicles within park boundaries. Visitor vehicles are by far the largest source of GHG emissions within park boundaries, estimated to account for 890,000 MTC02E in 2013 (see figure 24). The National Park Service does not include visitor vehicle emissions in its national GHG emissions estimates because the agency has limited influence over the travel behavior of visitors. However, the National Park Service is currently exploring methods to more accurately track and reduce visitor emissions.

Figure 24. Estimated 2013 NPS Transportation Emissions by Scope, Including Visitor Vehicle Emissions



1. Note: The federal government shutdown from October 1 through 16, 2013, probably contributed to a greater than expected rate of decline in transportation emissions in 2013.

Greenhouse Gas Emissions Mitigation

The Green Parks Plan sets objectives for addressing and reducing GHG emissions via park operations and planning. The plan includes servicewide mitigation targets, which apply equally to transportation and other sectors. Green Parks Plan emissions targets address emissions that derive from direct and indirect NPS activities; the targets do not currently include visitor vehicle emissions.

The Green Parks Plan transportation emissions reduction targets are to:

- Reduce Scope 1 and 2 GHG emissions by 35% by 2020, from the 2008 baseline
- Reduce Scope 3 GHG emissions by 10% by 2020, from the 2008 baseline

As of 2013, the transportation sector was well on its way to doing its part to meet the GPP targets. Although the federal government shutdown from October 1 through 16, 2013, probably contributed to a greater than expected rate of decline in transportation emissions in 2013, transportation-related emissions declined by approximately 33% for both Scope 1+2 and Scope 3 from 2008 to 2013.

Greenhouse Gas Emissions Mitigation Activities

Many NPS units have begun to reduce their carbon footprint and communicate the consequences of climate change through interpretive programs and educational materials. As of May 2014, 111 NPS units were participating in the Climate Friendly Parks (CFP) program (NPS 2014). This program, which the National Park Service initiated in collaboration with the Environmental Protection Agency in 2002, aims to reduce park-related GHG emissions and inform the public about the climate-friendly actions each park is taking. As part of the CFP program, NPS units develop and implement their own GHG emissions inventories and mitigation strategies. Mitigation measures associated with transportation-related emissions that NPS units have implemented include using alternative fuels, purchasing more fuel efficient vehicles, and minimizing work-related travel. Expanding and encouraging these kinds of park unit actions are important to the continued progress in reducing NPS transportation emissions. To support these efforts the National Park Service set up an interactive My Green Parks website to encourage NPS employees to take actions to conserve energy and decrease their carbon emissions. The program also provides an opportunity to build a ground-up transportation emission inventory that could include more detailed estimates of visitor vehicle emissions.

In addition to educating NPS employees, the National Park Service is also taking action to inspire visitors to reduce their environmental impacts both within and outside park boundaries. Because visitor vehicles are the largest source of GHG emissions occurring within NPS units, the decisions visitors make on their mode and method of travel once they arrive at a park unit may be the greatest contributing factor in meeting mitigation goals. To address this, the National Park Service developed a training program for interpretive rangers that provides tools to successfully educate visitors on the impacts of climate change and the role they can play in individual emission reductions. The National Park Service has also prepared a toolkit to assist park rangers in education and outreach efforts to reach sustainability goals, including climate change mitigation.

Appomattox Court House National Historical Park

Meeting Resource Protection Objectives

Objective: Incorporate natural and cultural resource considerations into all aspects of transportation decision-making to avoid, minimize, or mitigate negative resource impacts.

The National Park Service is committed to using context-sensitive solutions in planning and implementing its transportation systems to ensure that the transportation facilities impact as little as possible on their natural and cultural surroundings. Such context-sensitive solutions enable the National Park Service to preserve cultural and natural resources, while at the same time maintaining safety and mobility. Despite NPS efforts, transportation infrastructure can have negative impacts on the quality and integrity of the natural and cultural resources that the National Park Service is charged with protecting.

Improvements in the availability, consistency, and use of natural and cultural resource data is needed to make informed decisions regarding transportation investments as part of the Capital Investment Strategy. Several inventories exist for different types of natural and cultural resources; however, there is a lack of national-level guidance for data collection and management of these inventories, often resulting in disconnected databases with limited utility for transportation planning.

In addition to consistent data, planners also need consistent guidance on best management practices to minimize and mitigate transportation impacts to natural and cultural resources. Developing guidance for the effective management of these resources would assist with maintaining the long-term integrity of these assets.

Recommended Strategies:

Natural resource stewardship strategies:

Complete development of the Innovative and Sustainable Transportation Evaluation Process and Guidance process for planning, design, construction, operations, and maintenance of transportation facilities and systems.

Develop an assessment and monitoring framework to improve data collection and management regarding transportation impacts on natural resources. Use consistent methods to enable aggregate reporting of data. For wildlife vehicle collision data, pursue improved coordination and reporting of data in order to accurately reflect the extent and locations of wildlife-vehicle collision hotspots.

Use geographic information systems (GIS)-based natural and cultural resource data in the early stages of transportation planning and project development in order to identify areas of potential concern.

Build and strengthen collaborative partnerships with state transportation agencies and regional planning organizations in order to better position the National Park Service to coordinate design and placement of wildlife crossing infrastructure, and assist with improving air, sound, and light quality within NPS units and the surrounding areas.

Identify case studies and develop and disseminate guidance on best management practices to minimize and mitigate transportation impacts on natural resources.

Design and implement "Before-After-Control-Impact" studies to assess the effectiveness of mitigation measures, such as wildlife crossings and quiet pavement.

Cultural resource stewardship strategies:

Improve cultural resource data collection and data management processes. Create servicewide guidance for data collection, along with a recognized cultural resource transportation asset definition to ensure proper collection and identification of those assets. In addition, create a direct link between the FMSS database and both the LCS database, including both locations and assets, and the CLI (ongoing). These links will allow for informed investment decisions based on the cultural significance of NPS assets.

Develop and disseminate guidance on best management practices for preserving culturally significant transportation assets. This should include special contract requirements and compatible design solutions for the treatment of culturally significant transportation assets.

Objective: Minimize and mitigate the greenhouse gas emissions of the NPS transportation system.

The National Park Service is taking action to address climate change by actively reducing its carbon footprint and by raising staff and public awareness through educational avenues. Transportation sources contribute 40% of overall NPS GHG emissions. Although significant progress has been achieved in the last five years at reducing GHG emissions from the transportation sector, further efforts to reduce emissions and sustain these cuts will be necessary in order for the National Park Service to meet its overall GHG emission reduction goals.

The National Park Service estimates total servicewide GHG emissions for national reporting and has started developing detailed inventories on a park unit basis through the Climate Leadership in Parks program. Over time, the National Park Service seeks to complete a comprehensive emissions inventory generated at the park unit level, which in addition to providing information for national reporting, can provide detailed data for action at the unit level.

Currently, the NPS GHG emission reduction targets do not account for visitor vehicle emissions. Although not directly under NPS control, visitor travel within NPS units is the greatest source of GHG emissions servicewide. The National Park Service seeks to better understand the factors that affect visitor vehicle emissions within NPS units, and will continue and expand interpretive efforts, investments, and maintenance and operations decisions designed to reduce the carbon-intensity of visitor travel.

Recommended Strategies:

- Formalize a process for monitoring and reporting NPS transportation system emissions, beginning with servicewide estimates and moving towards a comprehensive bottoms-up inventory generated at the park unit level.

- Set reduction targets for visitor vehicle emissions and pursue solutions to achieve those targets.

- Gather and communicate successful actions taken by NPS units or regions to reduce NPS transportation system emissions.

Hawai'i Volcanoes National Park

Measuring Performance

Performance Measure: Number of wildlife-vehicle collisions involving the threatened and endangered species subset on all roadways within NPS boundaries.

Wildlife-vehicle collisions present a direct and measurable impact of transportation on park natural resources and can have significant impacts on wildlife populations for generations. Tracking wildlife-vehicle collisions on NPS roadways that involve those threatened or endangered species at risk as a result of road mortality will allow the National Park Service to gauge its performance in maintaining habitat connectivity, particularly for those species most vulnerable to road mortality.

BASELINE: Based on 2012 data, there are 32 NPS units with confirmed current populations of one or more of the threatened or endangered species subset threatened by road mortality. Baseline information for the number of wildlife vehicles collisions in those 32 parks are currently unknown and will be collected in fiscal year 2015.

TARGET: A target will be established in fiscal year 2015 following the completion of the threatened and endangered species subset mortality baseline. The target will include percent of key road crossing locations that develop modifications or adaptations that effectively reduce wildlife vehicle collisions and enhance population protection over a five year period.

Performance Measure: Complete all components of the Innovative and Sustainable Transportation Evaluation Process and Guidance process for planning, design, construction, operations, and maintenance of transportation facilities and systems.

The National Park Service is committed by mission, agency best practices, and federal law to provide visitor access to park units in a way that preserves resources for future generations. The INSTEP process will help decision makers identify opportunities to create and manage more sustainable transportation facilities and increase awareness of opportunities to incorporate innovative strategies to avoid, minimize, or mitigate negative environmental impacts caused by facilities and users. When operationalized, the INSTEP process will allow the National Park Service a greater ability to conduct long-term performance-based monitoring of resource conditions over a period of time.

BASELINE: The INSTEP process is currently under development.

TARGET: 100% completion of the INSTEP process and a majority of transportation projects using the INSTEP process by 2019. As transportation projects begin to use the INSTEP process, the National Park Service can set quantitative targets based on project scores.

Performance Measure: Aggregate Facility Condition Index (FCI) rating of highest priority historic Federal Real Property assets.

Preserving cultural resources and values for the enjoyment, education, and inspiration of this and future generations is at the core of the NPS mission. Overall, historic transportation assets are currently in worse condition than the overall asset portfolio. Tracking the condition of the highest priority culturally significant transportation assets over time will allow the National Park Service to gauge its performance in preserving these important resources.

BASELINE: The aggregated FCI of highest-priority historic FRP transportation assets is 0.210 (as of February 2014).

* Data from the Facility Management Software System were used to calculate the aggregated Facility Condition Index. Though not all historic FRP assets are currently included in the Facility Management Software System, it is currently the optimal system through which to track their condition.

** For the purposes of this performance measure, culturally significant transportation assets are defined as those that are included in the List of Classified Structures and the Cultural Landscape Inventory. The historic status of assets in both of these databases is part of the inventory of Federal Real Property. For culturally significant assets, highest priority is defined as Capital Investment Strategy Bands 1 and 2, gathered directly from the Facility Management Software System.

TARGET: Pending plan review.

Yosemite National Park

Performance Measure: Percentage decrease in NPS transportation system emissions.

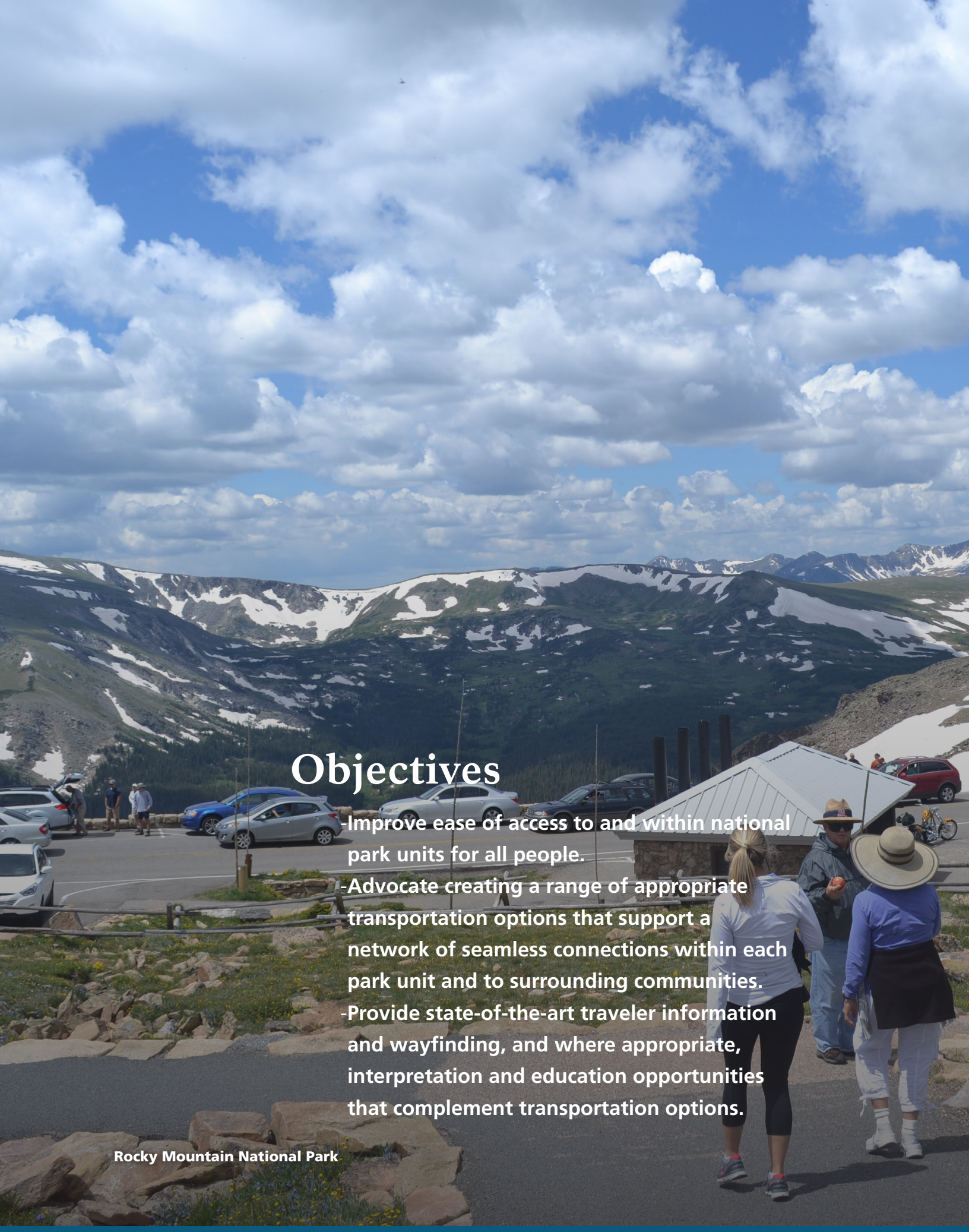
As part of the National Park Service commitment to being a climate leader, and in support of Executive Order 13514, the National Park Service is taking steps to reduce its GHG emissions. The National Park Service is actively measuring, inventorying, and reporting aggregate statistics for GHG emissions from all sources through servicewide reports. Individual NPS units have also started creating their own GHG inventories using the Climate Leadership in Parks tool, often including estimates of visitor vehicle emissions.

BASELINE: The performance measure uses a 2008 baseline, which is consistent with required federal agency reporting under Executive Order 13514:

Scope 1 and 2: 82,000 $MTCO_2E$
Scope 3: 104,000 $MTCO_2E$

TARGET: Meet or exceed Green Parks Plan targets for Scope 1 and 2, and 3, for overall NPS greenhouse gas emissions:

Scope 1 and 2: Reduction of 35% by 2020
Scope 3: Reduction of 10% by 2020



Objectives

-Improve ease of access to and within national park units for all people.

-Advocate creating a range of appropriate transportation options that support a network of seamless connections within each park unit and to surrounding communities.

-Provide state-of-the-art traveler information and wayfinding, and where appropriate, interpretation and education opportunities that complement transportation options.

Rocky Mountain National Park

Visitor Experience

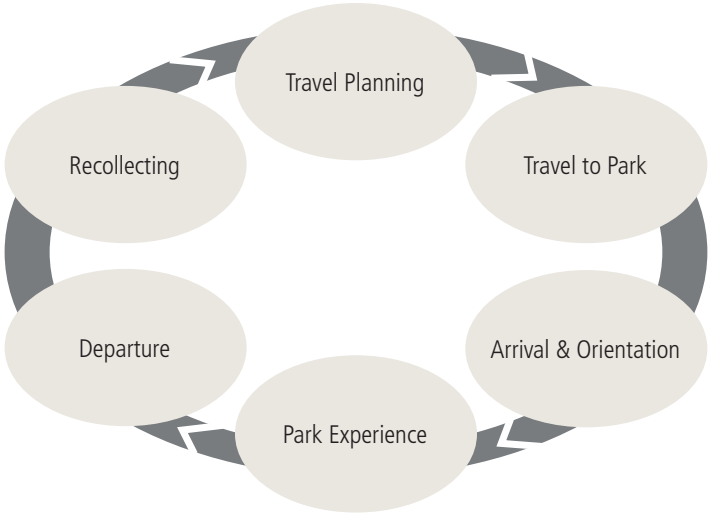
Goal: Maintain and enhance the quality of visitor experiences

Visitor experience is the perceptions, feelings, and reactions a person has before, during, and after a visit to a park (see figure 25). Everything about the transportation system, including its location, type, and design, strongly influences the quality of a visitor's experience. Visitor experience also includes how one views available opportunities and the quality of services provided at the park site. Visitor experience is an essential, albeit intangible, resource to manage, maintain, and enhance within every national park system unit.

Different user types, including local and nonlocal visitors and individuals who work on NPS lands, have varying transportation needs. Though NPS transportation networks are primarily intended to serve park units and visitors to those units, there are implications that extend beyond park boundaries. Populations residing in gateway communities are uniquely tied to their neighboring park units and are directly affected by their day-to-day operations, including the transportation system. Transportation can play a critical role in enhancing the economic and social well-being of gateway communities by creating and maintaining a safe, reliable, integrated, and accessible transportation network that enhances choices for transportation users, provides easy access to employment opportunities and other destinations, and promotes positive effects on the surrounding community.

The National Park Service is committed to developing and maintaining transportation facilities and services that improve access to parks for all users and contribute to maximizing the enjoyment of park resources and values. The primary factors that affect transportation-related visitor and user experience are visitor use characteristics, transportation barriers to visitation, traveler information, and transportation system usage.

Figure 25. Visitor Experience Cycle



Source: NPS Public Use Statistics Office


Glen Canyon National Recreation Area

Baseline Conditions & Macro Trends

Visitation and Visitor Use Characteristics

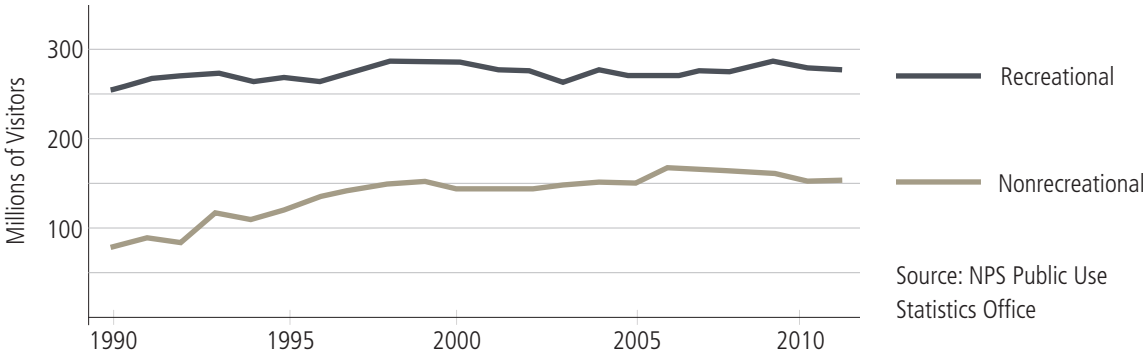
Characteristics of visitor use, which include the amount, type, timing, and distribution of visitor activities and behaviors, help in understanding traveler trends, user transportation needs, and influences on the experiences of visitors. The National Park Service has a great deal of information related to visitor use characteristics and visitation levels. However, visitation data collection methodologies vary by park unit and tend to change over time. Collection methods include both direct visitor counts and proxies, such as vehicle counts. As part of the NPS Traffic Monitoring Program there are permanent traffic counters at 34 park units; the Visitor Use Statistics Office uses traffic counters at an additional 206 park units. There are known inaccuracies with some traffic counters; the agency is currently developing guidance on how to improve traffic data collection. In addition, there is a lack of consistent data across all park units on visitor origins, the timing of visits, their patterns of use and distribution throughout the parks, or the information sources they use to plan their visits. These are all important elements on which traditional transportation planners base investment decisions. Having more detailed and accurate information about visitors and how they use park units would help the National Park Service ensure that transportation investment decisions are closely aligned with visitors' needs and desires.

TOTAL VISITATION. Nationally, recreation visit levels have remained largely consistent over the last 20 years while nonrecreation visits have increased dramatically (see figure 26). In 1990, total visitation, including recreation and nonrecreation visits, to NPS units was 335.2 million. Total visitation increased to 431 million in 2011. Over this timeframe, recreation visits increased by 9%, while nonrecreation visits increased by nearly 92%.

Recreation visit: The entry of a person onto lands or waters administered by the National Park Service for recreational purposes, excluding government personnel, through-traffic (commuters), tradesperson, and a person residing within park boundaries.

Nonrecreation visit: A reportable nonrecreation visit includes commuters and other through-traffic, persons going to and from inholdings, including subsistence users, tradespeople with business in the park, and government personnel (other than NPS employees) with business in the park.

Figure 26. Annual Visitation, 1990–2011



Source: NPS Public Use Statistics Office

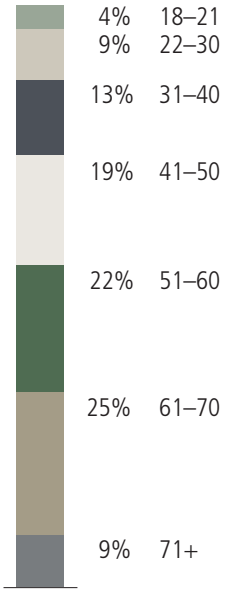
Trends in recreation visitation differ across NPS regions. The Alaska and National Capital regions have experienced substantial visitation growth since 1990 (although much of the increased visitation in the National Capital region is attributable to new monuments). The Intermountain, Midwest, and Northeast regions all experienced stable recreation visitation over the same period, while the Pacific West and Southeast regions experienced declining visitation (see table 10).

Table 10. Change in Recreation Visitation by Region (1990–2011)

	Recreation Visitation Change (in thousands)	% Change
Alaska	1,147	101.7%
Intermountain	2,144	5.3%
Midwest	2,103	11.2%
National Capital	12,000	36.1%
Northeast	8,829	19%
Pacific West	-451	-0.8%
Southeast	-50	-0.1%
Total	25,722	10.1%

Source: NPS Public Use Statistics Office

Figure 27. Visitor Age Distribution**
Source: University of Idaho 2013



** Due to the data collection method, data for visits by persons under the age of 18 were not captured.

The quality of a user's experience specific to transportation depends on the needs of the individual or group using the transportation system or facility; different user types may have varying transportation needs. Recreation and nonrecreation visitors have different transportation needs. Recreation visitors may value access to specific resources such as trailheads and day-use areas, and they may need more traveler information and wayfinding guidance than nonrecreation visitors. Nonrecreation visitors may also value scenic vistas, but they primarily require efficient access through NPS lands. The different needs between these two user groups can, at times, create conflict, particularly on parkways and commuting routes where interactions between the two groups is most common.

VISITOR PROFILES. According to 2013 survey data from 330 units, the majority of visitors to park units nationwide are more than 50 years old (see figure 27) and a higher percentage are female (55%). National park unit visitation is not uniform across groups from various racial and ethnic backgrounds. The majority of visitors are non-Hispanic White (approximately 80%), with African Americans and Hispanic Americans visiting at lower rates (NPS 2011a). Expanding use of park units by diverse communities and young people is a key tenant in the National Parks Service's A Call to Action initiative and its Healthy Parks, Healthy People plan. Both plans outline specific strategies that the National Park Service will implement in order to improve awareness of and access to national parks units from these populations.

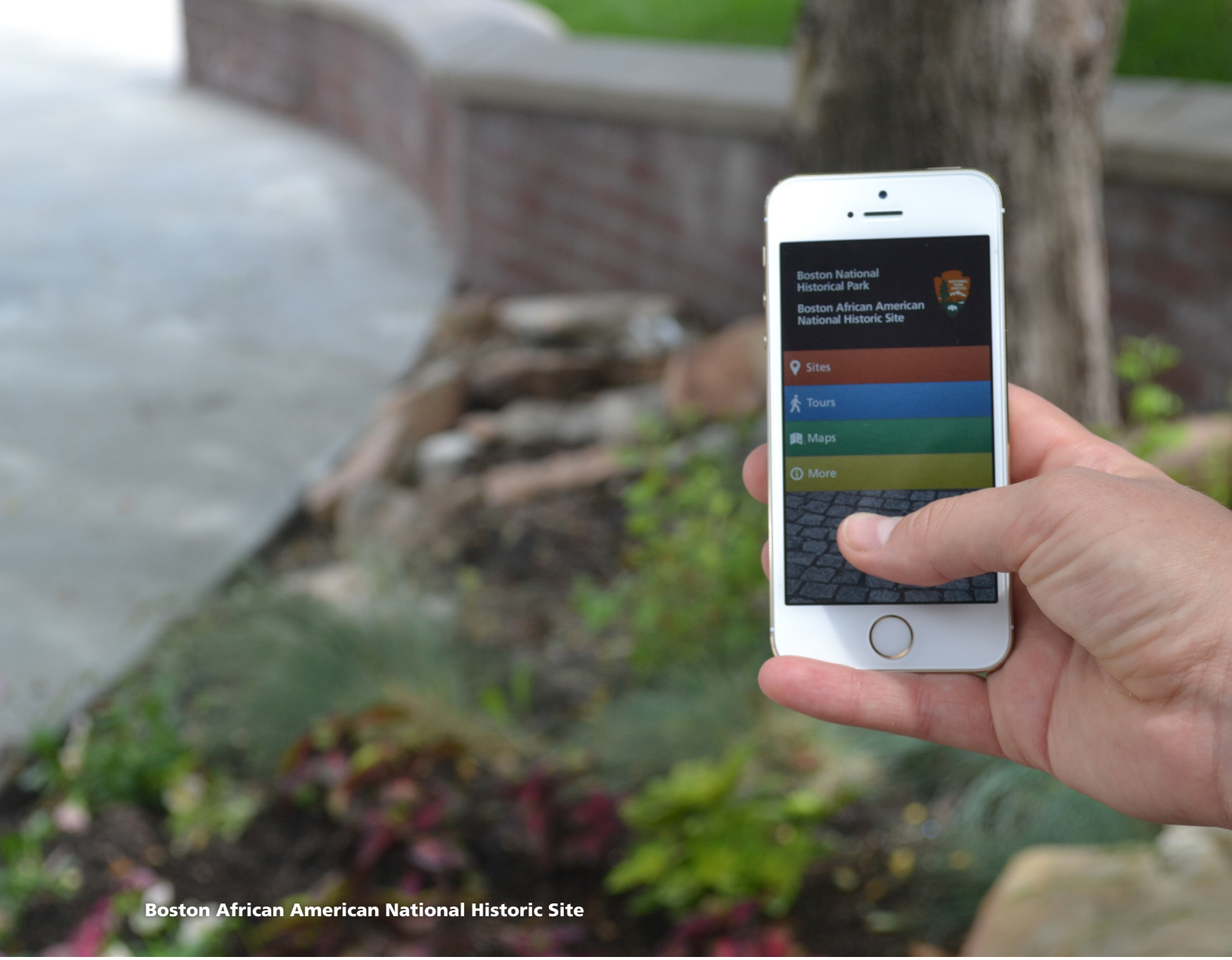
Transportation Barriers to Visitation

ACCESSIBILITY BARRIERS. The National Park Service is required to comply with the Architectural Barriers Act Accessibility Standards related to transportation. The standards for accessibility compliance have changed several times over the years, causing elements that may have formerly been compliant to become noncompliant. Because of this, NPS managers are encouraged to use the principles of universal design, which is the design of products and environments to be usable by all people, to the greatest extent possible, without adaptation or specialized design.

According to a survey done in 2010 for the National Organization on Disability, people with disabilities are more likely than those without disabilities to consider inadequate transportation to be a problem in daily life (34% versus 16%) (Harris Interactive 2010). That statistic is inclusive of all forms of disabilities, including not only mobility impairments but also seeing, hearing, and speech impairments; emotional or mental disabilities; and learning disabilities. Findings from the second National Park Service Comprehensive Survey of the American Public (CSAP2) (NPS 2011b) indicate that the accessibility of a park unit for people with disabilities acts as physical barriers to visitation. Sixteen percent of people surveyed either "strongly agree" or "somewhat agree" that NPS units are not accessible to persons with physical disabilities, and 13.9% neither agreed nor disagreed.

ADDITIONAL BARRIERS. CSAP2 respondents from racially and ethnically diverse backgrounds reported barriers and constraints at higher levels than their non-Hispanic White counterparts. While few non-Hispanic white visitors identified NPS units as unsafe, unpleasant, or places where poor service was received, visitors from racially and ethnically diverse backgrounds were more likely to do so. Nonvisitors from diverse racial or ethnic backgrounds were even more likely to identify these factors as obstacles to visitation.

The continued aging and diversification of the U.S. population have important implications for future demands and needs of the National Park Service transportation system. For example, older visitors are more likely to have mobility and visual impairments than younger visitors (Brault 2012). Transportation infrastructure and the associated travel information must be planned to meet the needs of visitors. The nation's growing diversity may necessitate the use of more inclusive communication methods, while the increasing number of older visitors may require new accessibility considerations.



Boston African American National Historic Site

Traveler Information

Traveler information, wayfinding, and signage are key transportation features that facilitate visitor travel to and within a park unit. Providing improved traveler information to potential visitors in advance of their trips may help to increase the public's awareness of NPS park units and their ease of access with visiting a unit. Effective traveler information and wayfinding signage improves visitor experiences by helping visitors navigate a park unit with ease. In addition, providing information on traffic and parking on websites, or through variable message signs or other methods, may help visitors avoid crowded locations and mitigate congestion.

Visitor traveler information needs may differ based on the context of the park unit's location (e.g., rural, urban), environmental or geographic setting, and the types of visitors it serves (e.g., visitors with disabilities, non-English speaking visitors, repeat visitors). Regardless of these differences, traveler information must always be provided to a wide range of visitors. NPS partners, including gateway communities and tourism partners, play a critical role in providing traveler information to visitors.

Currently, the National Park Service does not have a comprehensive understanding of which traveler information resources visitors use or how visitors prefer to receive that information.

Roadside signs are the most frequently used method of communicating transportation information to NPS transportation system users. In addition, the National Park Service provides several internet sources for potential visitors seeking traveler information. For example, all NPS unit websites provide a "Plan Your Visit" section that typically includes information on directions, maps, and other information needed to plan a park visit. Currently, the National Park Service is working to create consistency and content improvements to the "Plan Your Visit" pages on park units' websites, and is converting its websites to a new platform that will enable optimal viewing on mobile devices.

Advances in communication technologies are changing the way people access information. There is a rising use of GPS-enabled smartphones by the traveling public. Close to half (45%) of all American adults now own smartphones (Pew Research Center 2012a), as opposed to basic cell phones. The ability of these mobile devices to provide on-demand, just-in-time, personalized information is becoming a cultural standard. Nearly 75% of smartphone users access real-time information, including public transit schedules, current traffic conditions, and directions to locations on their smartphones (Pew Research Center 2012b). Potential visitors and visitors en route to NPS sites may desire to use mobile devices to access park unit-related information or receive pushed data for real-time routing, location data, and visitor and emergency information.

This increased reliance on receiving directions or location information from GPS devices, especially through smartphones, does pose a certain level of risk for visitors within national park units. Some GPS devices do not have accurate data for road systems within NPS units, which can lead to visitors getting lost. Cell reception and cellular data networks are often unavailable or inconsistent in large park units as well, so visitors may feel stranded when cut off from their main form of directions. In rare cases, these limitations have posed severe safety issues for visitors who need emergency assistance but cannot contact anyone or do not know how to identify their location. For these reasons, many park unit websites and maps (which are distributed at entrance stations) instruct visitors not to rely on GPS devices for navigation, or provide specific coordinates or names to enter into a GPS device to improve accuracy. Park unit websites usually note the lack of cell reception as well.

The NPS *A Call to Action* (NPS 2013g) acknowledges the need to use leading-edge technologies and social media to effectively communicate with the public, and calls for transforming the NPS digital experience to offer rich, interactive, up-to-date content from every park unit and program. Similarly, the *America's Great Outdoors: A Promise to Future Generations* (Department of the Interior, et. al. 2011) report and the *National Travel and Tourism Strategy* (Task Force of Travel Competitiveness 2012) acknowledge the important role that comprehensive, reliable, and accessible traveler information can play in enhancing recreational access and promoting travel and tourism to national park units. While many park units are employing new technologies, such as mobile device applications and quick response (QR) codes, to distribute information to mobile devices, the use of such technologies is not yet available servicewide. Regardless of the medium used, travel information must be planned to meet the needs of visitors. In particular, the nation's growing diversity may necessitate the use of more inclusive communication methods.

The National Park Service is also using advanced technologies to integrate interpretation into the transportation system. The National Park Service has partnered with Amtrak, which provides access to more than 237 park units, to develop free podcasts for select train routes that provide interpretation on the history and sites of interest along the route.

Transportation System Usage

Although some individual parks units and their respective local and state transportation partners collect transportation specific data on a unit level, there are no comprehensive data at the national level on automobile travel, such as vehicle miles traveled, level of service, time spent in congestion, and parking occupancy, nor are there comprehensive data on bicycle and trail use.

While it is not necessarily appropriate for all NPS units to accommodate access to or travel within the unit by multiple modes, NPS Management Policies 2006 states that "Depending on a park unit's size, location, resources, and level of use, the [National Park] Service will, where appropriate, emphasize and encourage alternative transportation systems, which may include a mix of buses, trains, ferries, trams, and—preferably—nonmotorized modes of access to and moving within parks." Although the National Park Service maintains numerous alternative transportation systems (e.g., shuttle/bus/van/tram systems, boat/ferry systems, planes, snowcoaches, and trains/trolleys), the private automobile remains the primary form of transportation that visitors use to access park units. The Federal Highway Administration estimates that vehicles travel more than 2.4 billion miles on NPS roads each year, based on a subset of 33 park units representing 63% of paved road miles for which vehicle miles traveled figures are available (FHWA 2008). This equates to approximately 22 miles per vehicle based on 2010 visitation levels.

Existing transportation systems that provide connections between park units and gateway communities vary widely across the national park system. There are approximately 150 transit systems serving more than 70 park units; 52 systems provide sole access to a site due to resource management needs or geographic constraints. In 2012, there were 36.3 million passenger boardings[1] across all transit systems serving NPS units. More than half of all passenger boardings (52.2%) were on a shuttle/bus/van/tram, while nearly as many (46.3%) were on a boat/ferry. Approximately 80% of all boardings in 2012 were associated with 10 transit systems. The vast majority of the transit systems (72%) had fewer than 100,000 passenger boardings in 2012 (NPS 2013h).

1. A "passenger boarding" occurs each time a passenger boards a vehicle. This is an industry standard measure also known as an "unlinked trip" and is used in the Federal Transit Administration's National Transit Database.

Grand Canyon National Park

Congestion and Congestion Management

Traffic congestion in some park units can be a serious concern, particularly during peak hours of the day or peak tourist season. Congestion is defined as a situation where the travel demand for a facility or service exceeds the capacity of that facility/service to handle the demand at performance levels considered acceptable to the facility/service users (Institute of Transportation Engineers 1997). Congestion can negatively impact the visitor experience and visitor safety and can impede visitor access to park resources.

The increasing urbanization of the U.S. population may have impacts on future congestion levels at park units. In recent years, the rate at which formerly rural or natural lands are becoming more urbanized has increased faster than the U.S. population. This trend is expected to continue; by 2030 87% of the U.S. population is expected to live in urban areas (Vassigh and vom Hove 2012). Increasing urbanization near park units would likely contribute to increased nonrecreational use of NPS transportation facilities (e.g., through-traffic), exacerbating congestion issues that some areas, such as the National Capital Region, are already experiencing.

In most cases, congestion is currently managed individually by park units. This approach of managing congestion often does not look broadly at the National Park Service as a whole, regionally or subregionally, which could lead to non-optimal allocation of resources across the National Park Service. To address this issue, the National Park Service is developing a systemwide congestion management system (CMS) that will enable NPS managers at all levels (park unit, region, and national) to allocate resources more effectively to address congestion-related problems. The National Park Service is developing its CMS in phases. Phase I laid the foundation for the CMS, with technical memos documenting available data, users and needs, and results from a 2010 servicewide park congestion survey.

Phase II of the congestion management system will further advance congestion management at the project and program level. Phase II will include business practices and tools to monitor and manage the usage levels of NPS transportation and recreation facilities, and will also provide managers with a toolkit of solutions and expected results for the congestion problems they are responsible for solving

Few park units collect quantitative data regarding congestion levels on a regular schedule. However, the 2010 servicewide congestion management survey (NPS 2011c) provides information on the most important congestion-related issues over the entire national park system. Of the 178 units that completed the survey, nearly one-half (49%) reported that they were currently experiencing congestion.

NPS managers who responded to the survey identified specific types of locations, known as "congestion emphasis areas" where congestion was present in the park unit. The most frequent area of concern was parking areas (70% of park units experiencing congestion) (see table 11). The most frequently reported congested time period was the midday tourist period, followed by commuter peak periods.

Table 11. Location Of Congestion In Parks

Location of Congestion	Percentage of Parks (N=178 units)
Parking areas	70%
Roadways providing access to park	41%
Visitor center	34%
Park entrance stations	29%
Primary park vehicle tour routes	28%
Pedestrian loading areas	25%
Pedestrian paths/trails	23%
Other park attractions	21%
Trailheads	18%
Scenic overlooks	16%
Transit stops	13%

Source: NPS 2011c

NPS units implement a variety of projects and management actions to reduce congestion based on the specific issues or challenges surrounding the causes of traffic congestion at the unit. According to the 2010 survey, the most common strategies used to manage congestion are: park ranger traffic management, special event management, changes in traffic circulation, and remote parking lots with shuttle service.


Apostle Islands National Lakeshore

Trends in Data Collection

The growing use of innovative technologies to collect transportation data provides opportunities to strengthen transportation planning. Gathering basic information on traffic frequency and speed is becoming easier and less costly due to new traffic counting devices. Likewise, the growing use of GPS-enabled smartphones provides an emerging method for collecting traveler information. These devices can accurately provide location and traffic data such as travel time, speed, acceleration, direction of travel, and mode of travel. Agencies are increasingly using crowdsourcing—the practice of obtaining needed services, ideas, or content by soliciting contributions from a large group of people—to gather data and inform planning and programming decisions. In addition, advances in intelligent transportation system and connected vehicle technologies are improving opportunities to collect and manage real-time, multimodal transportation data. These new technologies and crowdsourcing methods could provide the National Park Service with a more efficient means to collect accurate information on visitor travel behaviors including trip duration, trip timing (seasonality and time of day), origin and destination, persons per vehicle, parking demand, and congestion levels within parks.

San Antonio Missions National Historical Park

Meeting Visitor Experience Objectives

Objective: Improve ease of access to and within national park units for all people.

Poor accessibility for people with disabilities and older visitors acts a barrier to visitation. In addition, many park units experience traffic congestion during peak periods, which can negatively influence visitor experiences and impede visitor access to resources.

Improving access to park units, particularly for urban residents, minority communities, and people with disabilities, is a key goal outlined in several NPS plans and initiatives, including A Call to Action items 4, 5, 12, and 13 and the Healthy Parks, Healthy People plan. By reducing transportation barriers and managing congestion, the National Park Service will be better able to fulfill its mission by increasing access to opportunities for enjoyment, education, and inspiration of this and future generations.

Recommended Strategies:

Further develop a congestion management system that provides a programmatic approach to understanding and alleviating the highest-priority congestion issues.

Implement Phase II of the Congestion Management System:

Stakeholder engagement: Build institutional knowledge and support for the Congestion Management System.

Technical assistance: Develop technical assistance resources to assist parks with diagnosing congestion problems and identifying appropriate solutions.

Performance and monitoring: Conduct an evaluation of recent congestion mitigation projects to determine their effectiveness.

Research and development: Explore potential congestion indicators, thresholds, and performance measures and methodologies to assess congestion in lieu of servicewide quantitative congestion data.

Denali National Park and Preserve

Identify specific challenges and opportunities associated with connecting communities to park units, particularly for urban residents, minority communities, and people with disabilities.

Build partnerships with gateway communities and partners to ensure that the transportation systems within and adjacent to NPS boundaries are accessible to mobility restricted individuals and persons with disabilities.

At the discretion of regional transportation programs, support units in conducting assessments of physical and programmatic barriers with using the transportation system and preparing self-evaluation and transition plans to address those barriers. The self-evaluation and transition plan includes identification of barriers, solutions for barrier-removal, prioritization, and associated timeframes for removing those barriers.

Develop and deliver a comprehensive education and training program to all National Park Service staff, their U.S. Department of Transportation partners who are responsible for transportation contracts, and relevant stakeholders regarding accessibility compliance and the principles of universal design. The education program will include the development of suggested contract language.

Objective: Advocate creating a range of appropriate transportation options that support a network of seamless connections within each park unit and to surrounding communities.

The mode(s) of transportation used to reach and explore a park unit plays a major role in visitors' experiences. Each transportation mode offers a different kind of experience to visitors, and visitors make travel mode choices based on a wide variety of individual considerations, such as desired activities, time available, and past experiences with alternative transportation. Providing a range of transportation options has value to visitors, regardless of whether those modal options also serve other purposes, such as reducing congestion. While management strategies can influence mode choice in visitors, providing the highest possible degree of choice to visitors can enhance the quality of their experiences. The National Park Service strives to provide an efficient transportation system that consists of well-designed roadways and convenient linkages to regional transit, pedestrian, and bicycle systems.

Currently there is a lack of data regarding visitors and their use of the NPS transportation system. Having more detailed and accurate information about visitors, their perceptions and expectations of NPS transportation systems, and their travel patterns and behaviors will help park units make better investment decisions and measure the impacts of their transportation planning and programming decisions. It will also improve visitor experiences by ensuring that the transportation investment decisions are closely aligned with visitors' needs and desires.

Recommended Strategies:

Define and implement a consistent servicewide methodology for collecting data on visitor and employee transportation usage, including use of transit, pedestrian and bicycle trails, vehicle traffic volumes, and vehicle-miles traveled within park boundaries.

Coordinate with gateway communities and partners to identify existing transportation gaps and to provide multimodal options to improve connectivity to park units.

Support regions and units in pursuing discretionary funding opportunities to address gaps in nonmotorized connections and between modes.

Develop and disseminate best practice examples of methods to safely turn pedestrian and/or bicycle access into viable transportation options, such as installing "Share the Road" signs or bicycle racks at key locations.

Objective: Provide state-of-the art traveler information and wayfinding, and where appropriate, interpretation and education opportunities that complement transportation options.

Comprehensive, reliable, and accessible traveler information plays an important role in enhancing recreational access and promoting travel and tourism to NPS park units. The traveling public's increasing reliance on GPS-enabled smartphones is changing social expectations for accessing real-time, accurate, and relevant information. Visitor satisfaction is strongly tied to expectations, and disseminating traveler information prior to visitor arrival can prepare visitors for satisfying experiences.

The NPS A Call to Action acknowledges the need to use leading-edge technologies and social media to effectively communicate with the public, and calls for transforming the NPS digital experience to offer rich, interactive, up-to-date content from every park and program. Currently, the National Park Service does not have a comprehensive understanding of how best to broadcast traveler information or how visitors to national park units prefer to receive that information. Gaining a better understanding of these systems and how they are used by visitors will allow for more strategic investments for both information and communication technologies.

Recommended Strategies:

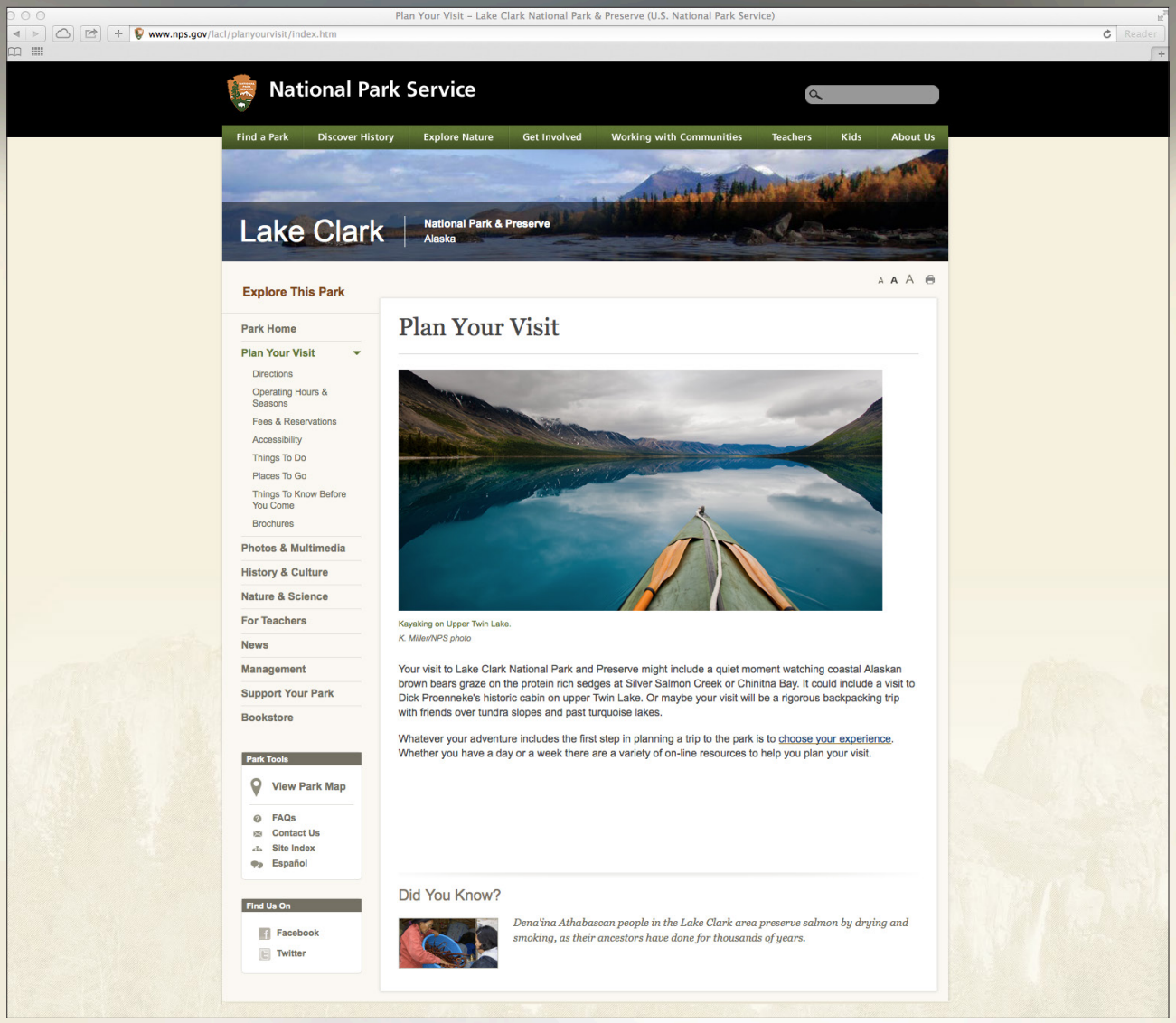
Conduct research to better understand visitor trip planning habits to inform efforts to develop trip planning tools and resources.

Develop a servicewide approach to disseminating traveler information on mobile devices.

Develop guidance for park units on how to use technology to improve traveler information for different area classifications and visitor characteristics.

Collaborate with partners to provide park unit traveler information, such as site traffic and road conditions, weather-related delays, facility closures, and parking conditions, within local and regional traveler information systems.

Create a standard format for the "Plan Your Visit" section of NPS.gov that systemizes the availability of essential traveler information across all units.



Lake Clark National Park and Preserve

Measuring Performance

Performance Measure: Percentage of park unit websites that provide essential travel information.

Visitor satisfaction is increased when visitors' expectations are met. Providing detailed information about the transportation system and a description of the transportation experiences at a park unit can help establish accurate expectations. A review of the Plan Your Visit portion of the 401 NPS unit websites indicates that park units do not currently provide the level of comprehensive traveler information recommended. Ensuring that all park units provide essential traveler information is an essential milestone in achieving the objective of providing state-of-the-art traveler information.

BASELINE: Park unit Plan Your Visit webpages that provide the following essential travel information as of April 2014:

Driving directions. Current status: 95% of park units

Public transportation information. Current status: 66% of park units

Bicycle/pedestrian information. Current status: 33% of park units

Information on parking lot locations and accommodations (e.g., accessible spaces, RV spaces, etc.). Current status: 51% of park units

Parking lot peak use/availability. Current status: 14% of park units

Acknowledgement of presence or lack of congestion at specific locations or times. Current status: 11% of park units

Travel distances and travel time to sites within the park unit. Current status: 36% of park units

Information on the accessibility of the transportation systems. Current status: 63% of park units

Description of transportation experience. Current status: 56% of park units

TARGET: 100% of park units provide essential traveler information on the Plan Your Visit webpage by 2019

Performance Measure: Completion of Phase II of NPS Congestion Management System

The National Park Service recognizes that managing congestion produces benefits that help the agency fulfill its missions, including improved visitor experiences, reduced resource impacts, and the opportunity to invest transportation funding more wisely. Completion of Phase II of the congestion management system will enable the National Park Service to develop a programmatic approach to understanding and alleviating the highest-priority congestion issues.

TARGET: 100% of CMS Phase II elements complete by 2019

Progress toward completion of the CMS will be tracked in four categories:

Stakeholder engagement: Internal and external communications.

Technical assistance: Diagnostic and treatment hotline.

Performance and monitoring: Congestion projects evaluation results.

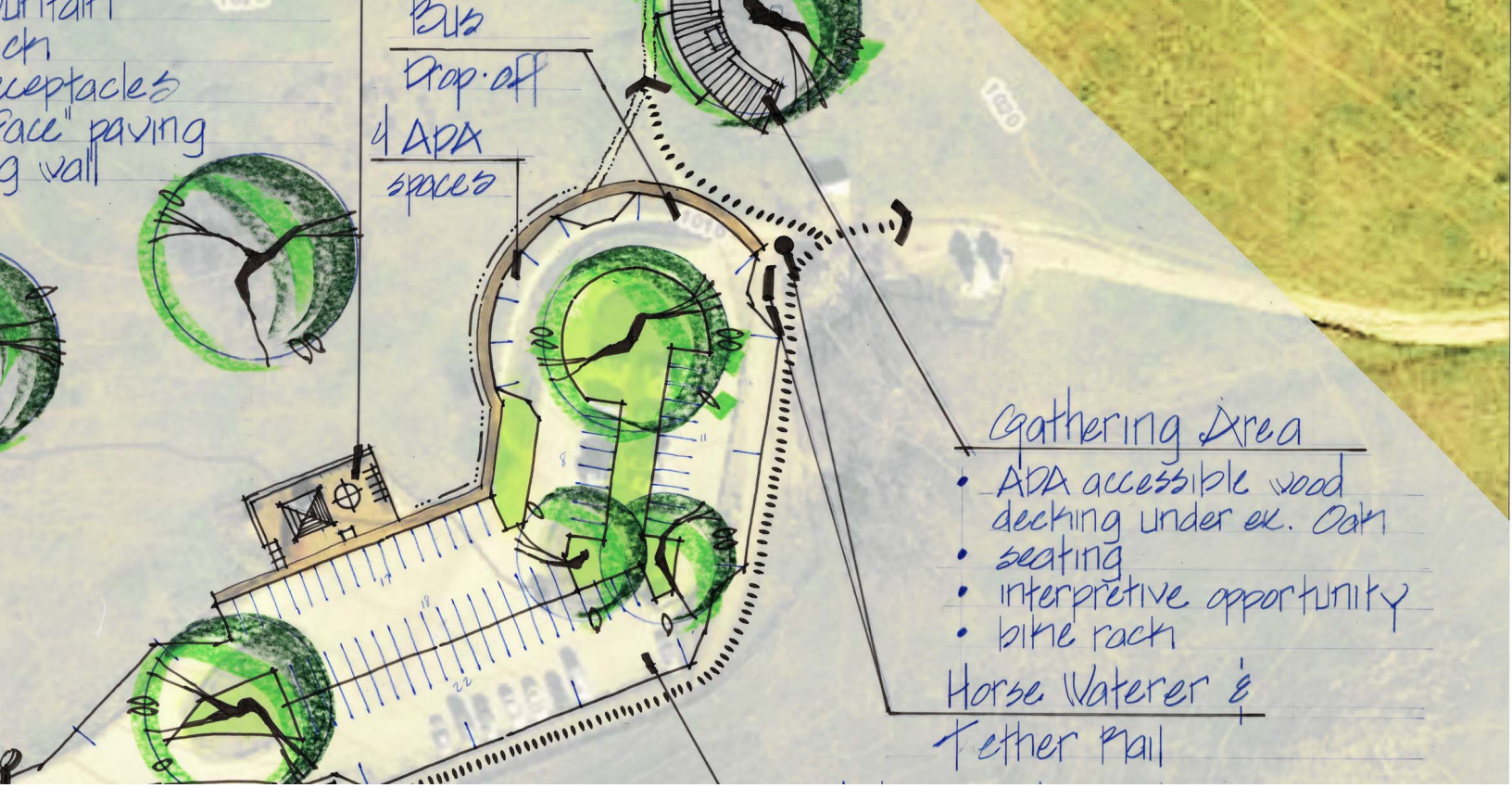
Research and development: Congestion performance measures/indictors/thresholds.

Santa Monica Mountains National Recreation Area

Performance Measure: Number of Transportation Contracts That Include Accessibility Language and are Compliant with the Architectural Barriers Act Accessibility Standards and Section 504 of the Rehabilitation Act of 1973

The National Park Service is committed to making all practicable efforts to make NPS transportation facilities and services accessible and usable by all people. Incorporating accessibility requirements into transportation-related contracts will help ensure that NPS transportation infrastructure and systems are designed and constructed to be accessible and usable by all people.

TARGET: 100% of contracts by 2019



Performance Measure: Number of Transportation Projects that Comply with the Architectural Barriers Act Accessibility Standards and Section 504 of the Rehabilitation Act of 1973

Ensuring that all new transportation projects comply with accessibility standards and requirements will help the National Park Service to meet its goal of improving the ease of access to and within park units for all people.

TARGET: 10% of transportation projects by 2019

Safety Objectives

- Institute a comprehensive, performance-based transportation safety program that addresses engineering, education, enforcement, and emergency response safety components.
- Maximize safety without impairing park resources and values.
- Reduce transportation-related incidents and prepare for emergencies.

Yellowstone National Park

Safety

Goal: Provide a safe transportation system for all users

The National Park Service operates in a unique environment where transportation safety must be maximized within the proper context of resource management. NPS transportation facilities are located within some of the most spectacular landscapes and culturally significant places in the United States. Because of this, many transportation facilities are built, maintained, and operated to be "context sensitive"—meaning they complement unique natural and cultural resources and promote the intended visitor experience of the park unit. In some cases, context sensitive design requires deviation from industry-standard safety practices. The National Park Service strives to be context sensitive in transportation design and operations while ensuring appropriate safety mitigation measures are in place.

Visitor and workforce safety are among the highest priorities of the National Park Service, but transportation is still a significant source of safety risk for users of NPS transportation systems. The most recently compiled safety data show that an average of 6,900 crashes occur each year on NPS roads, of which 20% resulted in injury or fatality. Recent safety data suggest motor vehicle crashes are a leading cause of death for visitors and a major source of injury for NPS employees.

Individual park units manage safety for their transportation networks, but the National Park Service currently lacks an effective motor vehicle crash data collection system and comprehensive transportation safety guidance to support planning and programmatic decision making servicewide. Efforts are underway to establish a performance-based approach to transportation safety; however, gaps in crash data reporting and analysis have slowed this effort. To address this issue, the National Park Service is committed to developing an industry-standard safety management system built upon improved crash data. Improved data collection combined with performance-based planning approaches will allow the National Park Service to improve prevention strategies and increase safety on its transportation networks.

Mount Rainier National Park

Baseline Conditions & Macro Trends

Improving the Transportation Safety Program

One of the most important measures of transportation safety are the number and rate of fatalities, injuries, and crashes suffered by users of the system. To reduce fatalities, injuries, and crashes, transportation safety professionals need modern safety management systems to more effectively target prevention efforts.

The National Park Service's current Transportation Safety Program (TSP), funded through the Federal Lands Transportation Program, prioritizes safety projects based on their effectiveness at reducing the number and severity of crashes. The National Park Service is required by law (23 CFR 970.212) and directed in NPS *Management Policies 2006* to use crash data to inform decision making relating to transportation, law enforcement, emergency response, and other related programs. Data analysis about where, when, and why crashes occur in NPS units are the foundation to an industry-standard Transportation Safety Program enabling the National Park Service to make programmatic, performance-based decisions.

The National Park Service currently needs a comprehensive national crash dataset. The most recent comprehensive crash data for the National Park Service were compiled between 1990 and 2005, covering 222 park units. These data were compiled in the Servicewide Traffic Accident Reporting System (STARS) database, which is no longer in use due to software incompatibility. Since 2005, crash records have continued to be collected by individual park units but have not been compiled in a national dataset.

To strengthen the Transportation Safety Program, the National Park Service is developing a comprehensive Transportation Safety Management System (TSMS) that will bring together data on crashes, traffic volume, and roadway features and condition to identify the most cost-effective opportunities to improve safety. Building a comprehensive safety management system to collect, analyze, and report these data are essential to all NPS safety programs.

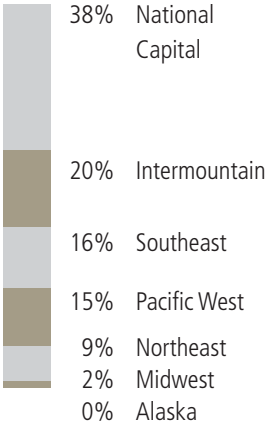
In a related effort, the Department of Interior (DOI) is transitioning to a new reporting system, the Incident Management and Reporting System (IMARS), which is designed to record, store, and analyze all incidents occurring in DOI units that involve law enforcement, including motor vehicle accidents. When complete, the system will record motor vehicle accidents and be the primary source of NPS and partner federal land management agency crash data.

The Transportation Safety Management System is the software system that will serve as the foundation of the Transportation Safety Program. The TSMS software system includes the following components: (a) a crash data system, (b) a traffic data system, (c) a crash analysis system, (d) a data-driven project programming and delivery system, and (e) a performance measure tracking system. Together, these systems will provide NPS leadership with the critical information needed to support data-driven programmatic safety decisions.

The Transportation Safety Program for the National Park Service is a comprehensive and data-driven program that will provide input and guidance to NPS decision makers on the development and deployment of safety initiatives. The Transportation Safety Program uses data outputs from the Transportation Safety Management System, best practices, and safety research to identify policies and practices to reduce the number and severity of transportation incidents.

Crash Data

Figure 28. Percent of Systemwide Crashes by NPS Region (1990-2005)



Between 1990 and 2005, there were 110,067 reported vehicle crashes in NPS park units, with more than 20% resulting in injury or fatality. During this period, 21,448 injury crashes resulted in 32,894 injuries, and 673 fatal crashes resulted in 800 fatalities on NPS roads. There were more than 1,600 vehicle crashes involving pedestrians or bicyclists on NPS roads during the same period, of which nearly half resulted in injury or fatality. Between 1990 and 2005, there was a yearly average of 6,900 vehicle crashes resulting in an average of 50 fatalities and 1,300 injuries on the NPS road network, making motor vehicle crashes the second leading cause of death among visitors and a major source of employee injury.

The National Capital Region experiences higher traffic volumes within park units and contains more parkways than other regions, which factors into the higher crash percentages. Furthermore, commuters from the Washington, D.C., metropolitan area constitute the majority of travelers on five of the major parkways the National Park Service owns and operates, a use that was not intended or anticipated when these parkways were designed and built. The percent of total crashes for both vehicles and nonmotorized transportation was highest in the National Capital Region, where 39% of vehicle crashes and 53% of nonmotorized crashes occurred (see figure 28).

1. All crash data are derived from the NPS Servicewide Traffic Accident Reporting System (STARS database).

Crash Types

The most common systemwide crash types are lane departure (run-off-the road) collisions, rear-end collisions, wildlife-vehicle collisions, and intersection collisions (see figure 29 and figure 30). Human behaviors (distracted driving, speeding, and other actions or inactions) contributed to 62% of total crashes, followed by environmental factors (animals and weather conditions), which contributed to 15% of total crashes. Three percent of total crashes and 7% of severe accidents involved alcohol or drug impairment, which is markedly lower than state reporting.

Crashes are not evenly distributed throughout the year or by time of day. One third of all crashes occurred in the summer months of June, July, and August and 69% of crashes occurred in daylight hours. These daily and seasonal trends correspond with peak visitation in national park units.

Figure 29.
NPS Systemwide Type Of Collision for All Crashes (1990–2005)

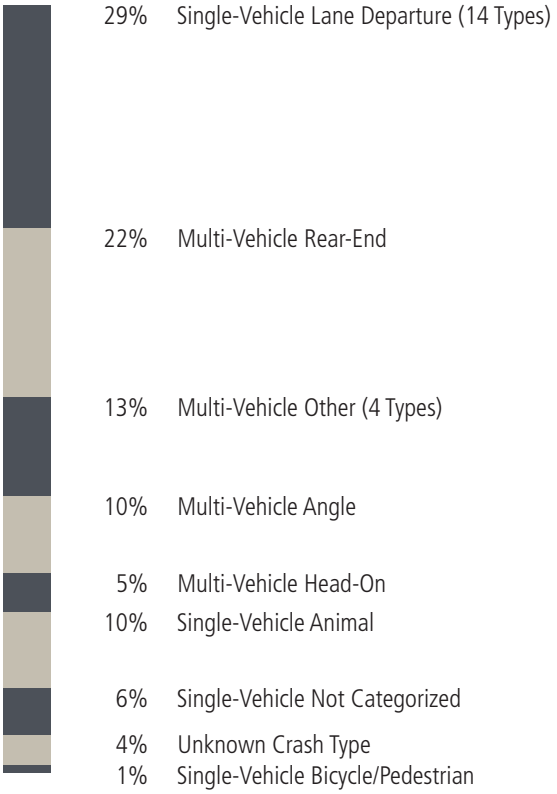
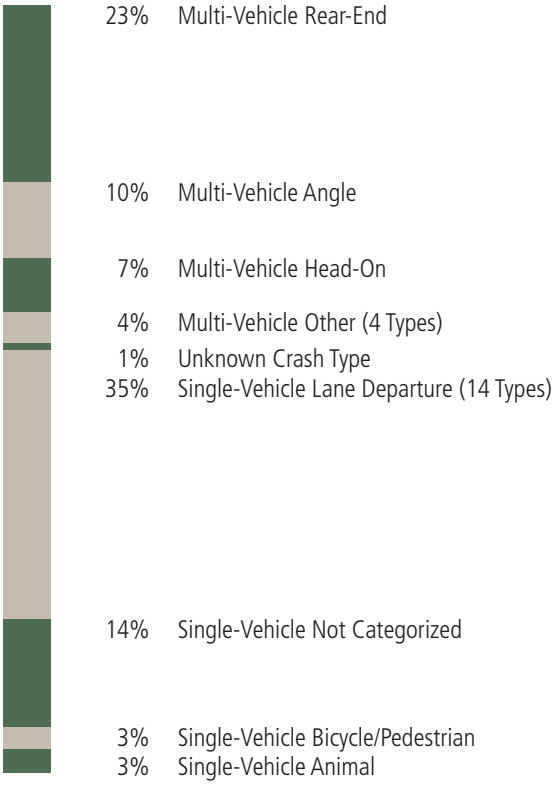


Figure 30:
Type of Collision for Fatal and Injury Crashes (1990–2005)



Crash Prevention

The National Park Service is working to identify safety emphasis areas to guide limited funds into strategies that offer the greatest potential for reducing fatal and injury crashes. Crash prevention strategies used to address safety emphasis areas often integrate the 4 E's of transportation safety – engineering, enforcement, education, and emergency response.

The NPS priority safety emphasis, based on the most recently available NPS crash data, is placed on:

KEEPING VEHICLES ON THE ROADWAY AND MINIMIZING THE CONSEQUENCES OF LEAVING THE ROAD: Single vehicle lane departure crashes are the most common crash type, accounting for 29% of total crashes and 35% of severe crashes (injury or fatal) (NPS 2009). The majority of single-vehicle crashes are lane-departure crashes, which often involve a vehicle leaving the roadway and striking an object such as a tree, boulder, or man-made object. Just over half of the severe crashes on NPS-managed roads are lane-departure crashes (NPS 2009). For comparison, roadway departure crashes account for 51% of fatal crashes and 23% of all crashes that occur on public roadways nationally (NHTSA 2011a, 2011b).

REDUCING REAR-END COLLISIONS: Rear-end collisions are the second most common crash type on NPS roads, involving 22% of total crashes and 23% of severe crashes (NPS 2009). Nationally, rear-end collisions account for 29% of all crashes that occur on public roadways (NHTSA 2007a).

REDUCING CRASHES AT INTERSECTIONS: Angle collisions are the second most common type of crashes among multiple-vehicle crashes, accounting for 10% of all fatal and injury crashes on NPS roads (NPS 2009). Most angle collisions occur at intersections. Nationally, angle crashes account for 21% of fatal crashes and 54% of all crashes that occur on public roadways nationally (NHTSA 2007b).

REDUCING WILDLIFE-VEHICLE COLLISIONS: Wildlife-vehicle collisions accounted for 10% of total crashes on NPS roads, and were the most common total crash type in the Intermountain, Northeast, and Southeast regions (NPS 2009). Because many collisions with small animals are not reported, wildlife-vehicle collision percentages may be significantly higher. For comparison, the national wildlife-vehicle percentage of total crashes on all public roads is estimated at 4.6% (Huijser et al. 2008). Wildlife-vehicle collisions can cause human injuries and fatalities, especially when incidents involve large species such as deer, elk, and moose. Reducing interactions between vehicles and wildlife would not only improve wildlife habitat connectivity, but also increase visitor safety and ultimately provide long-term cost savings related to responding to these common, reoccurring incidents on NPS roadways.

REDUCING HEAD-ON COLLISIONS: Head-on collisions account for 5% of total crashes and 7% of fatal and injury crashes within NPS (NPS 2009). Head-on collisions accounted for 18% of fatal crashes that occur on public roadways nationally (NCHRP 2003).

REDUCING CRASHES RESULTING FROM HUMAN BEHAVIORS: Driver actions are the highest contributing factors (62%) for crashes on NPS roads, with some causation attributed to environmental conditions (15%), including animals in the roadway (NPS 2009). Human behavior encompasses distracted, impaired, and aggressive driving.


Cape Cod National Seashore

Emergency Response and Evacuation

Timely and proper treatment of transportation incidents is essential for potentially reducing the severity of injuries. Transportation plays an essential role in providing access for emergency response vehicles and providing a means to evacuate visitors and employees in an emergency situation. Each year the NPS Search and Rescue and Emergency Medical Services carry out an average of more than 4,000 search and rescues and respond to an average of more than 14,400 emergency medical events in park units. Coordination with outside law enforcement and first responders is essential, including working together and establishing clear jurisdictional roles. Although some larger NPS units employ their own emergency personnel, in many cases NPS units rely on partner organizations (primarily state or local governments) to perform emergency services. Sharing road data and maps with well-marked evacuation routes that are suitable for emergency vehicles is critical to ensuring that first responders can locate and rescue visitors in need. Ensuring that emergency response and evacuation considerations are systematically included in park unit transportation plans will improve response times and help keep park visitors safe from hazardous conditions.

Example Prevention Strategies from the Four E's of Safety

Comprehensive safety strategies are typically developed around four major components of highway safety, referred to as the 4 E's: engineering, enforcement, education, and emergency response. The most effective strategies address all 4 E's and can be tailored to respond to locally identified problems at each park unit.

Example preventions strategies employed at NPS units across the 4E's are:

EDUCATION: Safety information must be communicated to help visitors understand transportation safety risks and comply with regulations. Safety education provides information to drivers about the rules of the road and roadway conditions, and advises them on making good choices, such as not texting while driving and wearing a seatbelt. Park units have conducted high-visibility educational strategies such as increased or enlarged signage, traffic safety checkpoints, and public relations campaigns. U.S. Park Police in the Maryland, Virginia, and D.C. areas participate in the "Smooth Operator" program to combat aggressive driving. As part of this campaign, enforcement waves coincided with media blitzes to inform and educate the public about the dangers of aggressive driving.

ENGINEERING: Engineering incorporates safety countermeasures on roadways to reduce the number of errors made by drivers navigating the road. In response to safety issues identified in a planning study, Blue Ridge Parkway installed rumble strips, median barrier, lighting, and additional steel backed timber guardrail, and are upgrading the historic guard walls to be crashworthy while still blending with the context of the parkway character. Natchez Trace Parkway installed profile edge markings near bridge approaches in lieu of rumble strips to improve night/rain visibility without deterring from the quiet, rural driving experience.

Canyonlands National Park

ENFORCEMENT: Effective, consistent, and continuous traffic law enforcement plays an important role in reducing traffic accidents and improving transportation safety. Enforcement of traffic laws and a visible police presence tend to deter motorists from engaging in unsafe driving behavior. Park units have conducted high-visibility enforcement strategies such as speeding, seat belt usage, and driver behavior. U.S. Park Police and Rangers at Acadia, Delaware Water Gap, Zion and Great Smoky Mountains national parks worked together to increase public perception of the high risks and consequences of driving under the influence through public awareness campaigns and sobriety checkpoints.

EMERGENCY RESPONSE: Timely and proper emergency response is essential for visitor and workforce safety as well as protection of critical park resources. Parks can reduce accident response times through training exercises and coordination with partners. The Delaware Water Gap National Recreation Area is currently in the process of analyzing whether emergency medical services response time in the park is sufficient and developing strategies to improve partner coordination. Strategies include improving the collection and sharing of crash information to produce more accurate crash reports and using global positioning system (GPS) technology to improve response time and location information related to emergency medical services. As another example, Bandelier National Monument installed a series of automated alert systems that notify NPS rangers and designated first responders of eminent flash flooding risks after a large wildfire burn in 2011. These types of roadway mitigation measures are critical for timely emergency response and evacuation, visitor and employee life and safety, and protection of critical resources and infrastructure.


Zion National Park

Meeting Safety Objectives

Objective: Institute a comprehensive, performance-based transportation safety program that addresses engineering, education, enforcement, and emergency response safety components.

The National Park Service is committed to addressing transportation safety and instituting a performance-based, programmatic approach is key to improving safety on the NPS transportation network. In June 2012, leadership from the National Park Service, U.S. Park Police, and Federal Highway Administration began work on a new national Transportation Safety Program. The Transportation Safety Program framework and charter includes recommendations for actions, coordination, and a strengthened agency commitment to transportation safety within the context of the NPS mission to protect valuable natural, scenic, recreational, and cultural resources.

The current lack of nationally aggregated crash data has hindered the effective management of NPS safety issues. Continuing and strengthening current NPS efforts to improve the collection, recording, analysis, and reporting of crash data will help the Transportation Safety Program focus limited funding on the highest priority transportation safety needs. Development of an industry-standard Transportation Safety Management System, which will aggregate safety data, will enable analysis that can be integrated into project prioritization and selection, operations, and maintenance decision-making processes to make transportation within the National Park Service safer.

Continued support and prioritization of the development of the Transportation Safety Program and Transportation Safety Management System is critical to fulfilling NPS commitments to reducing traffic incidents on the park transportation system and improving safety outcomes for all users.

Recommended Strategies

Implement a performance-based Transportation Safety Program to develop safety projects that address safety emphasis areas.

Develop, support, and fund the Transportation Safety Management System in order to provide critical data and analysis needed to guide performance-based programming and monitor the extent to which emphasis area goals and objectives are being met.

Encourage regions and parks to identify the required resources and action steps for implementing appropriate safety countermeasures.

Capture and share best practices for transportation safety across the service.

Objective: Maximize safety without impairing park resources and values

The National Park Service strives to balance the need to implement context-sensitive designs that preserve park resources and values with maintaining safety conditions. During the project delivery process, the context of important cultural, historic, and natural resources and viewsheds are often considered for exceptions to safety design standards. As a result, some existing transportation facilities do not meet current engineering standards. Whenever design exceptions are considered, appropriate mitigation measures are also evaluated and applied as needed to help ensure safety.

Coordination between engineering and cultural and natural resource staff during the project design process is a critical piece in developing a safety strategy that accommodates a park unit's setting and supports the user experience. Beginning such coordination in the early stages of transportation planning and carrying it throughout the project development process enables staff to identify design alternatives and mitigation options early. Such early coordination can help to avoid unforeseen environmental or safety issues from arising later in the project development process, when they have greater impacts on project schedules and budgets.

Recommended Strategies

Establish processes and/or tools that facilitate early and continuous consultation with resource protection and visitation experts during transportation safety planning, programming, and project development.

Develop and disseminate guidance on best practices for context-sensitive transportation design and operations that improve safety.

Objective: Reduce transportation-related incidents and prepare for emergencies

Park unit emergency evacuation and safety training plans are essential tools for ensuring visitor and workforce safety. Because of transportation's critical role in emergency response, these plans should explicitly identify evacuation routes that are suitable for emergency response vehicles. Currently, not all park units have plans in place, and some existing plans have not been updated to factor in changing conditions.

The existence of an emergency evacuation and safety training plan is not enough to ensure that visitors and the NPS workforce will be safe. An increased understanding of safety issues by visitors and the NPS workforce is needed in order to reduce transportation-related incidents. The National Park Service is committed to communicating the limits of navigation technology and to encouraging visitors to adequately prepare for their visits to remote areas where they may not be able to easily call for help. Enforcement and awareness campaigns have shown potential to help raise awareness of safe practices.

Recommended Strategies

Pursue enforcement initiatives that will reduce fatal and injury crashes, such as distracted driving, speeding, seat belt enforcement, and drunk driving campaigns. Share successful campaigns and implementation best practices.

Ensure that all park units have an up-to-date evacuation plan with a transportation component that identifies critical signage and evacuation routes.

Improve ability of transportation users to notify emergency responders of their locations by installing mileposts, markers, and other landmarks.

Lake Mead National Recreation Area

Measuring Performance

Performance Measure: Completion of Transportation Safety Management System Components

Completion of the Transportation Safety Management System is an essential milestone in the implementation of the National Park Service's new performance-based approach to transportation safety. This effort relies, at least partially, on the continued development of the DOI IMARS crash data collection system.

As of September 2013, the Transportation Safety Management System is approximately 35% complete, with a goal of 100% completion by 2018.

Progress toward completion of five elements of the Transportation Safety Management System will be tracked in five categories:

CRASH DATA SYSTEM MILESTONES: Crash database (Traffic Accident Reporter, TAR) established; field reporting of incidents; output capability from the TAR database; amount of data populated into the TAR database. Current status: 30% complete.

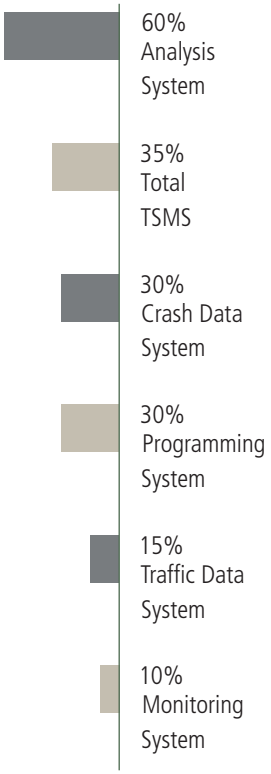
TRAFFIC DATA SYSTEM MILESTONES: Rehabilitation of traffic count stations. Current status: 15% complete.

ANALYSIS SYSTEM MILESTONES: Availability of professional resources, including crash analysis software. Current status: 60% complete.

PROGRAMMING SYSTEM MILESTONES: Data-driven project safety evaluation criteria developed; project proposal and evaluation tied to safety performance metrics; project evaluation processes informed by data and analysis and performance metrics. Current status: 30% complete.

MONITORING SYSTEM MILESTONES: Mitigation efforts and countermeasures evaluated using data and analysis; project delivery and programming are improved based on data and analysis in light of performance goals and metrics. Current status: 10% complete.

Figure 31: TSMS module completion as of September 2013



Mount Rainier National Park (c) Allen Mock

Investment Strategies

The cost to operate and maintain the NPS transportation system in a state of good repair is $1.38 billion annually. The National Park Service forecasts that only $391 million in annual funding will be available going forward, leaving an annual gap of almost $1 billion. While it is highly unlikely this gap can be eliminated, the National Park Service is committed to spending every transportation dollar wisely in order to provide the safest, most reliable, and most enjoyable experience to the traveling public within these funding constraints. The historical analysis of transportation spending for the period FY2006 through FY2012, presented in the financial chapter of this plan, revealed four potential strategies to improve the allocation of NPS transportation funds:

- Direct funding to the highest priority assets and services.
- Direct funding to deferred maintenance needs.
- Meet operations and preventative maintenance needs.
- Coordinate financial strategies among different levels of the National Park Service (unit/region/national program) and among different funding program managers.

This chapter explores and compares four alternative investment strategies, in addition to the Business as Usual strategy, each one representing a different philosophy for how transportation funding could best be invested. The alternative investment strategies are:

- **BUSINESS AS USUAL:** continues the recent investment approach, using historical priorities, asset categories, and asset lifecycle stages, with one exception of increasing investments in bridges.
- **BUSINESS AS USUAL PLUS CAPITAL INVESTMENT STRATEGY (CIS):** continues the historic investment approach in asset categories and asset lifecycle stages (with the exception of bridges), but aligns with the Capital Investment Strategy by strictly prioritizing investments in highest priority needs.
- **ADDRESS DEFERRED MAINTENANCE PLUS CIS:** accelerates the reduction of deferred maintenance by redirecting two-thirds of investments in day-to-day work to recurring maintenance and component renewal.
- **ADDRESS OPERATIONS AND MAINTENANCE (O&M) PLUS CIS:** meets all operations and preventative maintenance needs by redirecting investments from low-priority planning and administration, capital, and recurring maintenance needs.
- **MULTIMODAL PLUS CIS:** invests in a more multimodal transportation system by redirecting investments from other priority roads and bridges to highest and high priority transit, trails, intelligent transportation systems, marinas, and other supporting infrastructure.

Mount Rainier National Park

Every transportation investment decision the National Park Service makes comes with trade-offs. The results of these investment strategies indicate that by focusing on highest priority assets first, the National Park Service can improve conditions and reduce the deferred maintenance of these assets first, while maintaining the same overall level of deferred maintenance as business as usual. However, strategies to reduce deferred maintenance at the expense of operations and preventative maintenance may negatively affect visitor experience and actually accelerate condition deterioration and accretion of deferred maintenance. In contrast, fulfilling nearly all operations and preventive maintenance needs, would mean less funding is available to reduce existing and anticipated deferred maintenance. Additional modeling may help strike a balance between investing in operations in maintenance and addressing deferred maintenance in a sustainable manner.

Alternative Investment Strategies

Every transportation investment decision the National Park Service makes comes with trade-offs. We are always striving to improve our approach to transportation investments, and there are many potential approaches that may lead to positive results. There is no one right way to invest wisely. This LRTP explores four alternative investment strategies (in addition to the Business as Usual strategy) and compares their outcomes. The financial modeling results that follow translate those philosophies into forecasted physical and programmatic funding effects, including future condition of facilities, deferred maintenance backlog, and funding of programmatic needs.

Outcomes of each strategy are modeled assuming annual funding of $391 million, a 6-year planning horizon for roads and bridges, and a 20-year planning horizon for other facilities. Table 1 below summarizes the investment levels and outcomes of all strategies, including how the strategies affect the condition of the NPS transportation system, the degree to which they can reduce the deferred maintenance backlog, and the degree to which they address other critical programmatic needs.

Three systems are used to evaluate condition of facilities in table 1: Pavement Condition Rating (PCR) for roads and parking, Bridge Health Index (BHI) for bridges, and Facility Condition Index (FCI) for all other facilities. A higher PCR or BHI number reflects better condition for roads and bridges respectively, while a lower number of FCI represents better conditions for the remainder of the NPS transportation facilities. All financial figures are represented in 2012 dollars. Assumptions and notes are presented at the end of this section.

MEASURING CONDITION

- **PAVEMENT CONDITION RATING (PCR)** – Physical or modeled condition of paved roads and paved parking. A higher number corresponds with better pavement condition, with 100 representing perfect condition and values higher than 85 representing good condition.

- **BRIDGE HEALTH INDEX (BHI)** – Physical or modeled bridge condition measurement. A higher number corresponds with better bridge health conditions, with 100 representing perfect condition and values higher than 92 representing good condition.

- **FACILITY CONDITION INDEX (FCI)** – Used to measure all other facilities. FCI is not based on physical measurements of condition; rather, it represents the estimated cost of deferred maintenance divided by the facility's current replacement value. A lower FCI corresponds with a better condition, and zero represents no documented deferred maintenance.

The National Park Service Has Adopted the CIS for Roads

During development of this National LRTP, national and regional Federal Lands Transportation Program (FLTP) managers have agreed on a funding strategy for their program going forward. The funding strategy is consistent with the Capital Investment Strategy in that it focuses spending on highest priority roads including park roads and rural parkways (Functional Class 1), connector park roads (Functional Class 2), and urban parkways (Functional Class 7). The coordinators agreed to manage this subset of roads to a performance target and to track the deteriorating condition of all other roads.

With the exception of the Business As Usual strategy, all strategies presented here incorporate this new approach to funding roads and parking areas. In contrast, the Business As Usual strategy demonstrates road investment outcomes using the historical investment patterns according to priority: 74% of funding toward highest priority (Functional Class 1), 13% toward high priority (Functional Classes 2 and 7), and 13% toward other priority (Functional Classes 3, 4, 5, 6, and 8).

The outcomes of the Business As Usual and Business as Usual + CIS clearly show the advantages and trade-offs of a CIS-based approach to the FLTP. By focusing on highest priority investments first, the National Park Service focuses its attention on its most pressing and mission critical needs. But without additional funding, all lower priority assets will quickly fall into poor condition.

Table 12. Alternative Investment Strategy Investment Levels and Outcomes

	Current Conditions	Business as Usual	Business as Usual + CIS	Address Deferred Maintenance + CIS	Address O&M + CIS	Multimodal + CIS
Investment Levels						
Total		**$391.1 M**	**$391.1 M**	**$391.1 M**	**$391.1 M**	**$391.1 M**
Roads & Parking		**$236.2 M**	**$236.2 M**	**$236.1 M**	**$236.2 M**	**$180.6 M**
Improves Condition		$171.7 M	$171.7 M	$193.1 M	$141.6 M	$135.2 M
Does Not Improve Condition		$64.5 M	$64.5 M	$43.0 M	$94.6 M	$45.4 M
Bridges & Tunnels		**$42.1 M**	**$42.1 M**	**$42.2 M**	**$42.1 M**	**$36.7 M**
Improves Condition		$41.1 M	$41.1 M	$41.8 M	$25.3 M	$35.8 M
Does Not Improve Condition		$1.0 M	$1.0 M	$0.4 M	$16.8 M	$0.9 M
Transit		**$27.3 M**	**$27.3 M**	**$27.3 M**	**$27.3 M**	**$39.0 M**
Improves Condition		$6.9 M	$6.9 M	$8.0 M	$4.2 M	$11.2 M
Does Not Improve Condition		$20.4 M	$20.4 M	$19.3 M	$23.1 M	$27.8 M
Other Facilities		**$85.6 M**	**$85.6 M**	**$85.6 M**	**$85.6 M**	**$135.1 M**
Improves Condition		$66.8 M	$66.8 M	$79.2 M	$50.8 M	$114.7 M
Does Not Improve Condition		$18.8 M	$18.8 M	$6.4 M	$34.8 M	$20.4 M

	Current Conditions	Business as Usual	Business as Usual + CIS	Address Deferred Maintenance + CIS	Address O&M + CIS	Multimodal + CIS
Resulting Condition						
Roads & Parking (PCR)*						
FC 1, 2, 7	82	79	80	81	79	79
FC 3, 4, 5, 6, 8	64	66	56	56	56	56
Bridges (BHI)*	92.0	89.6	89.6	89.6	88.1	89.1
Other Facilities (FCI)**	**0.191**	**0.281**	**0.281**	**0.257**	**0.313**	**0.186**
Culturally Significant***	0.294	0.198	0.250	0.186	0.280	0.063
Highest Priority	0.249	0.087	0.000	0.000	0.087	0.000
High Priority	0.297	0.427	0.437	0.348	0.479	0.092
Other Priority	0.107	0.291	0.326	0.326	0.326	0.326
Resulting Deferred Maintenance						
Roads & Parking*						
FC 1, 2, 7	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable
FC 3, 4, 5, 6, 8	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable
Bridges*	$400.0 M	$543.0 M	$543.0 M	$540.0 M	$620.0 M	$569.0 M
Other Facilities**	**$2,032.0 M**	**$2,982.1 M**	**$2,982.1 M**	**$2,722.6 M**	**$3,317.9 M**	**$1,978.5 M**
Culturally Significant***	$1,207.7 M	$812.5 M	$1,026.3 M	$766.8 M	$1,150.2 M	$260.6 M
Highest Priority	$608.8 M	$213.8 M	$0.0 M	$0.0 M	$211.9 M	$0.0 M
High Priority	$863.6 M	$1,242.3 M	$1,271.8 M	$1,012.3 M	$1,395.7 M	$268.2 M
Other Priority	$559.6 M	$1,526.0 M	$1,710.3 M	$1,710.3 M	$1,710.3 M	$1,710.3 M
Yrs to resolve Highest Priority DM		Unresolved	16	13	Unresolved	6

* 6-year modeling horizon predicts outcomes as of2020. Road analyses were prepared by the FHWA in support of the National LRTP. Bridge analyses were conducted by the FHWA in support of the NPS Reauthorization Resource Paper published in 2013 and for the NPS in 2013.

** 20-year modeling horizon predicts outcomes for Other Facilities as of 2034. FCI outcomes include programmatic needs.

*** Culturally Significant outcomes are also included in the outcomes for OB1, OB2, OB3, 4, 5 assets.

*** Programmatic Needs are also included in the Deferred Maintenance outcomes.

	Current Conditions	Business as Usual	Business as Usual + CIS	Address Deferred Maintenance + CIS	Address O&M + CIS	Multimodal + CIS
Resulting Programmatic Needs****						
Roads & Parking*						
FC 1, 2, 7	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable
FC 3, 4, 5, 6, 8	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable
Bridges*	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable
Other Facilities**	**$249.0 M**	**$129.3 M**	**$95.7 M**	**$95.7 M**	**$129.3 M**	**$92.2 M**
Culturally Significant***	$141.4 M	$21.7 M	$21.7 M	$21.7 M	$21.7 M	$18.2 M
Highest Priority	$153.2 M	$33.6 M	$0.0 M	$0.0 M	$33.6 M	$0.0 M
High Priority	$32.1 M	$32.1 M	$32.1 M	$32.1 M	$32.1 M	$28.6 M
Other Priority	$63.7 M	$63.7 M	$63.7 M	$63.7 M	$63.7 M	$63.7 M

* 6-year modeling horizon predicts outcomes as of2020. Road analyses were prepared by the FHWA in support of the National LRTP. Bridge analyses were conducted by the FHWA in support of the NPS Reauthorization Resource Paper published in 2013 and for the NPS in 2013.

** 20-year modeling horizon predicts outcomes for Other Facilities as of 2034. FCI outcomes include programmatic needs.

*** Culturally Significant outcomes are also included in the outcomes for OB1, OB2, OB3, 4, 5 assets.

*** Programmatic Needs are also included in the Deferred Maintenance outcomes.

Modeling Assumptions and Notes

- Other facilities include all transportation asset categories other than paved roads, parking, bridges, and tunnels. These include trails, marinas, buildings, unpaved roads, intelligent transportation systems, aviation, and everything else.
- Deferred maintenance for roads is not modeled for the strategies due to resource constraints.
- Programmatic needs for roads and bridges are not modeled because they are not tracked in the systems of record for those asset types.
- Roads and bridges are modeled with a 6-year horizon, while other facilities are modeled with a 20-year horizon.
- Outcomes for transit systems are not modeled because there currently is no transit management system at a national scale.
- Asset lifecycle stages (introduced in the financial chapter) that improve condition and reduce deferred maintenance include capital, component renewal, and recurring maintenance.
- Asset lifecycle stages that neither improve condition nor reduce deferred maintenance include planning and administration, operations, and preventative maintenance.
- For this analysis, priorities for roads are determined by Functional Class. Highest and high priorities include park roads and rural parkways (Functional Class 1), connector park roads (Functional Class 2), and urban parkways (Functional Class 7). Other priorities include special purpose park roads (Functional Class 3), primitive park roads (Functional Class 4), public roads that access National Park Service facilities/offices (Functional Class 5), restricted access administrative roads (Functional Class 6), and urban streets (Functional Class 8).
- The National Park Service has historically spent $17 million on 4R and new construction road projects (reconstruction, realignment, large bridge replacement, and new construction). Due to the nature of these projects, it is difficult to disaggregate the deferred maintenance reduction accomplished from other project components, so this category is assumed to leave deferred maintenance unchanged.
- All funding spent on roads from Operational Base, even if anticipated to be spent on recurring maintenance activities, is assumed to not directly improve condition or reduce deferred maintenance. Instead, these activities slow or prevent decline in current conditions.
- All bridges are assumed to be highest priority.
- Rehabilitation of the Arlington Memorial Bridge is excluded from all strategies.

Business as Usual

The Business as Usual strategy continues the recent investment approach, using historical priorities, asset categories, and asset lifecycle stages, with one exception: the National Park Service has committed to increasing investments in bridges from a historical annual average of $25 to $35 million. This strategy allocates funding to priority levels based on an analysis of past spending on roads at 16 large parks.[12] For roads, this strategy applies $149 million to highest and high priorities, and $22 million to other priorities.

Advantages:

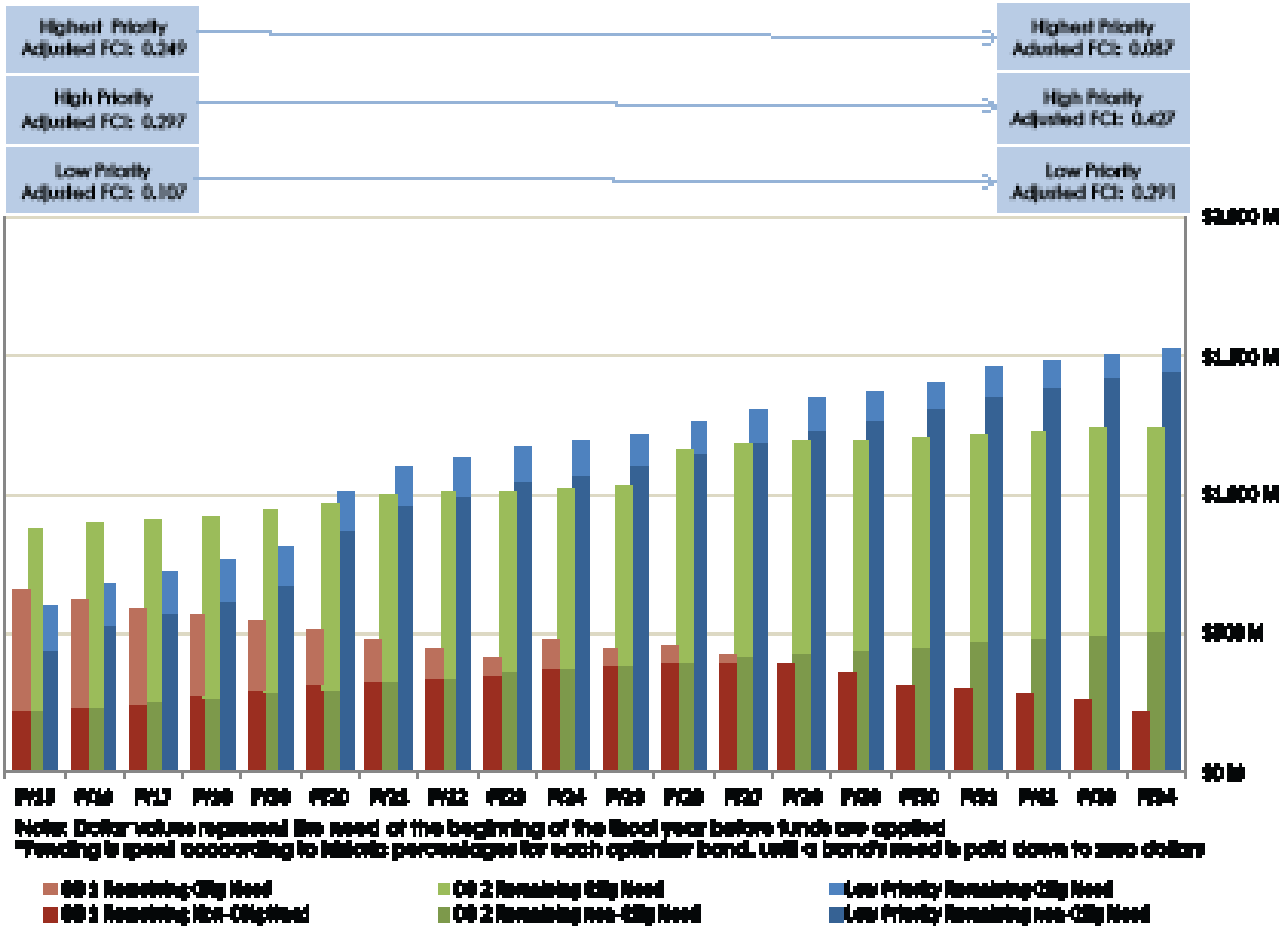
- Culturally significant assets (non-roads and non-bridges) are improved from an FCI of 0.294 to 0.198.
- Other priority assets are maintained at a higher condition than other strategies presented in this chapter; however, investment in high priority assets is a main tenet of the Capital Investment Strategy.

Disadvantages:

- Highest priority needs are not addressed first. For example, the PCR of highest and high priority roads declines from current condition, while the PCR of other priority roads increases. The same trend is seen for Other Facilities. For these assets, while all FCI priority levels decline, other strategies demonstrate how highest priority needs may be addressed first.
- Does not accelerate reduction of the deferred maintenance backlog.
- Does not fully fund operations and preventative maintenance needs.

12. Historic priorities based on optimizer bands were converted to functional class for this analysis.

Figure 32. Deferred Maintenance Outcomes of Business as Usual Strategy for Other Facilities, by Priority.



Source: BAH DM Strategy Modeling

Business as Usual + CIS

The Business as Usual + CIS strategy continues the historic investment approach in asset categories and asset lifecycle stages (with the exception of bridges as described above), but aligns with the Capital Investment Strategy by strictly prioritizing investments in highest priority needs. High priority needs are addressed only after highest priority needs are fully met, and other priority needs are addressed only after all high priority needs are met. For roads, this strategy (and all other strategies following this strict priority approach) applies all funding available (in this case, $171 million) to improve the condition of highest and high priorities, and no funding to other priority roads.

The results from this strategy are similar to the Business as Usual strategy. In fact, deferred maintenance for Other Facilities is exactly the same under both of these strategies. However, under the Business as Usual + CIS strategy, the condition, deferred maintenance, and programmatic needs of the highest and high priority facilities are addressed first. This means that under this strategy every dollar spent is assured to go to highest priority, mission critical needs.

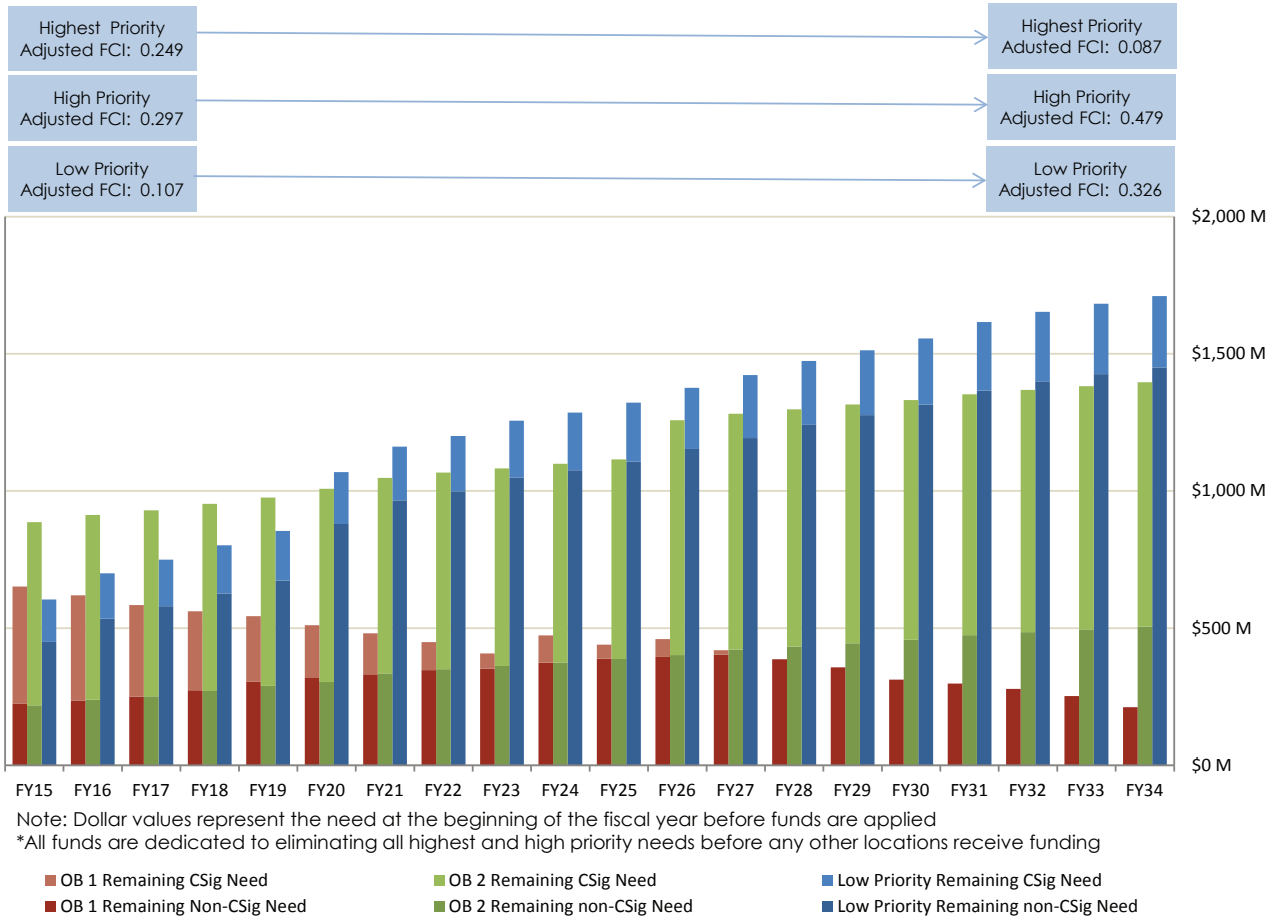
Advantages:

- Deferred maintenance for other facilities' highest priority needs is fully retired in year 16. FCI of these assets is greatly improved.
- Highest and high priority roads are 1 PCR point better under this strategy than the Business as Usual strategy.

Disadvantages:

- Although highest and high priority roads are in better condition by 1 PCR point when compared with the Business as Usual strategy, the condition of other priority roads decreases by 10 PCR points.
- Does not accelerate the reduction of deferred maintenance backlog.
- Does not fully fund operations and preventative maintenance needs.

Figure 33. Deferred Maintenance Outcomes of Business as Usual + CIS Strategy for Other Facilities, by Priority.



Source: BAH DM Strategy Modeling

Address Deferred Maintenance + CIS

The Address Deferred Maintenance + CIS strategy accelerates the reduction of deferred maintenance. It accomplishes this by redirecting two-thirds of investments in day-to-day work such as operations and preventive maintenance, as well as programmatic work, such as planning and administration, to recurring maintenance and component renewal. Under this strategy investments are only shifted as allowed under current funding program project eligibility rules. The Address Deferred Maintenance + CIS strategy follows the strict priority investment approach described in the Business as Usual + CIS strategy above. Unlike all the other strategies, the Address Deferred Maintenance + CIS strategy eliminates new construction/4R roads projects. Estimated at $17 million, these projects are assumed to leave condition and deferred maintenance unchanged.

Under this investment strategy, the deferred maintenance backlog shrinks, but many of the small tasks that help maintain transportation assets in a state of good repair are left undone. A visitor to a park may see fewer rough roads and closed sections of parking lots, but may notice unmowed grass, less timely snow plowing, or unstriped roads.

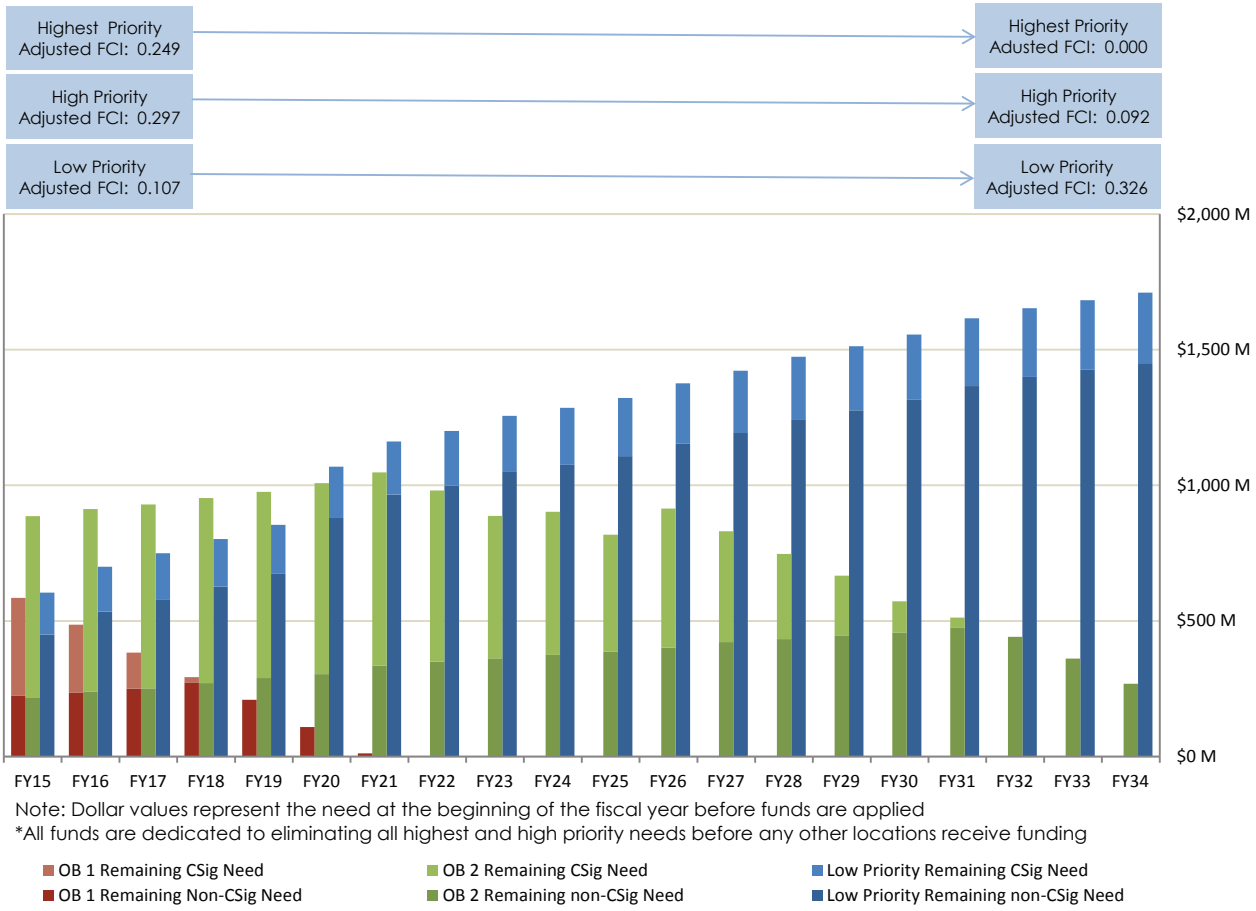
Advantages:

- Reduces deferred maintenance on highest and high priority assets sooner than with the Business as Usual + CIS strategy.
- Deferred maintenance for other facilities' highest priority needs is fully retired in year 13.

Disadvantages:

- Significantly reduces operations and preventative maintenance spending on roads, transit, and other facilities.
- Underspending in operations may affect visitor experience.
- Underspending in preventative maintenance will accelerate the pace at which assets deteriorate and will probably cause failures that will become future deferred maintenance.

Figure 34. Deferred Maintenance Outcomes of Address Deferred Maintenance + CIS Strategy for Other Facilities, by Priority.



Source: BAH DM Strategy Modelling

Address O&M + CIS

The Address O&M + CIS strategy meets all operations and preventative maintenance needs in order to take care of facilities, maximize service life, minimize total cost of facility ownership (TCFO), and slow the accrual of deferred maintenance. It accomplishes this by redirecting investments from low-priority planning and administration, capital, and recurring maintenance needs. Investment is only redirected as allowed under current funding program project eligibility rules. The Address O&M +CIS strategy also follows the strict priority approach described in the Business as Usual + CIS strategy above.

This strategy results in achievement of nearly all operations and preventive maintenance needs, thus minimizing the rate at which assets deteriorate. However, less funding will be available to reduce existing and anticipated deferred maintenance.

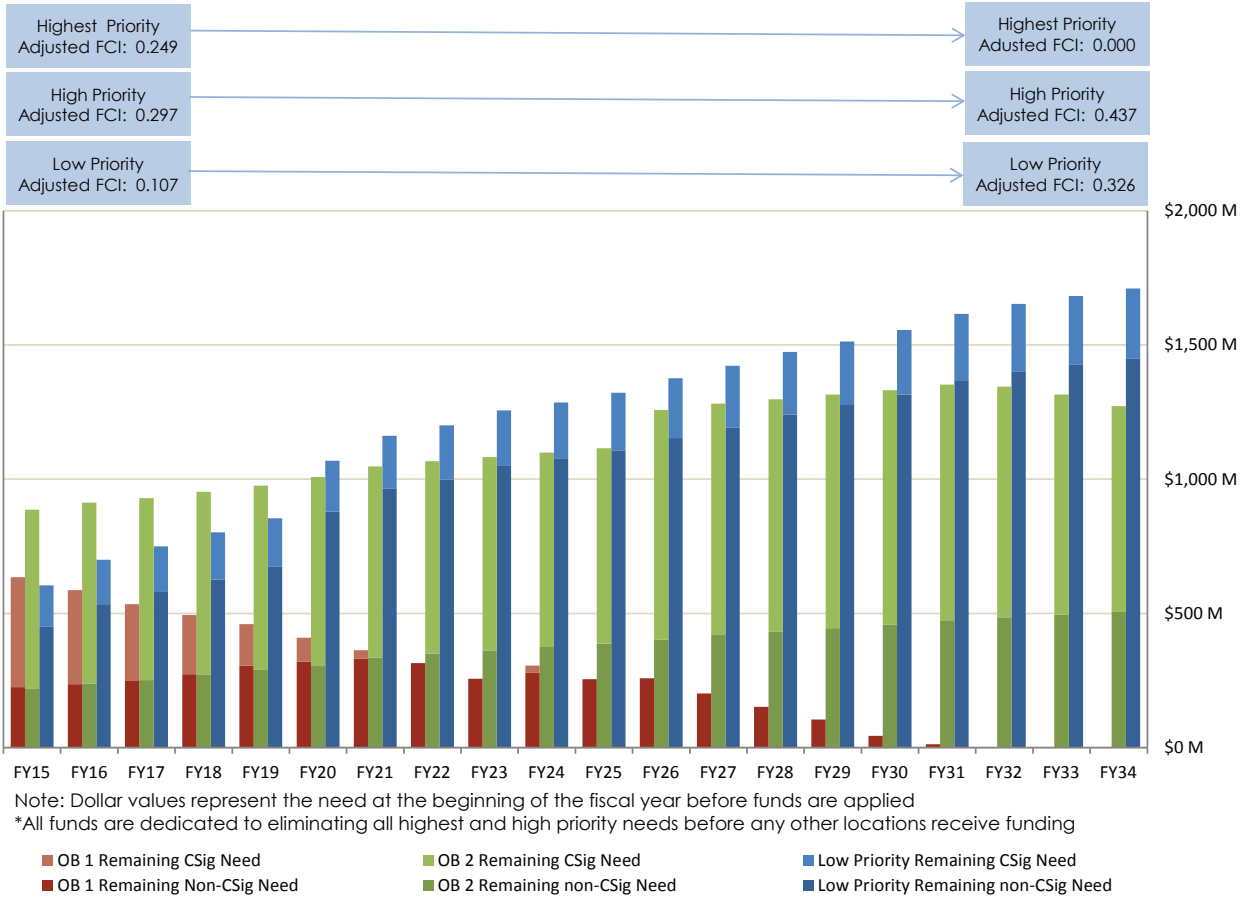
Advantages:

- Operations and preventative maintenance are fully funded and deterioration of the NPS transportation system and accretion of additional deferred maintenance are minimized.
- Highest priority needs are addressed first.

Disadvantages:

- Although the rate of degradation is minimized, overall condition of roads, bridges, and other facilities is worse than all the other strategies.
- Limited funding is available for when assets eventually fail or require rehabilitation.

Figure 35. Deferred Maintenance Outcomes of Address O&M + CIS Strategy for Other Facilities, by Priority.



Source: BAH DM Strategy Modeling

Multimodal + CIS

The Multimodal + CIS strategy invests in a more multimodal transportation system. This strategy redirects investments from other priority roads and bridges to highest and high priority transit, trails, intelligent transportation systems, marinas, and other supporting infrastructure. Investments are redirected only as allowed under current funding program eligibility rules. The Multimodal + CIS strategy also follows the strict priority approach described in the Business as Usual + CIS strategy above.

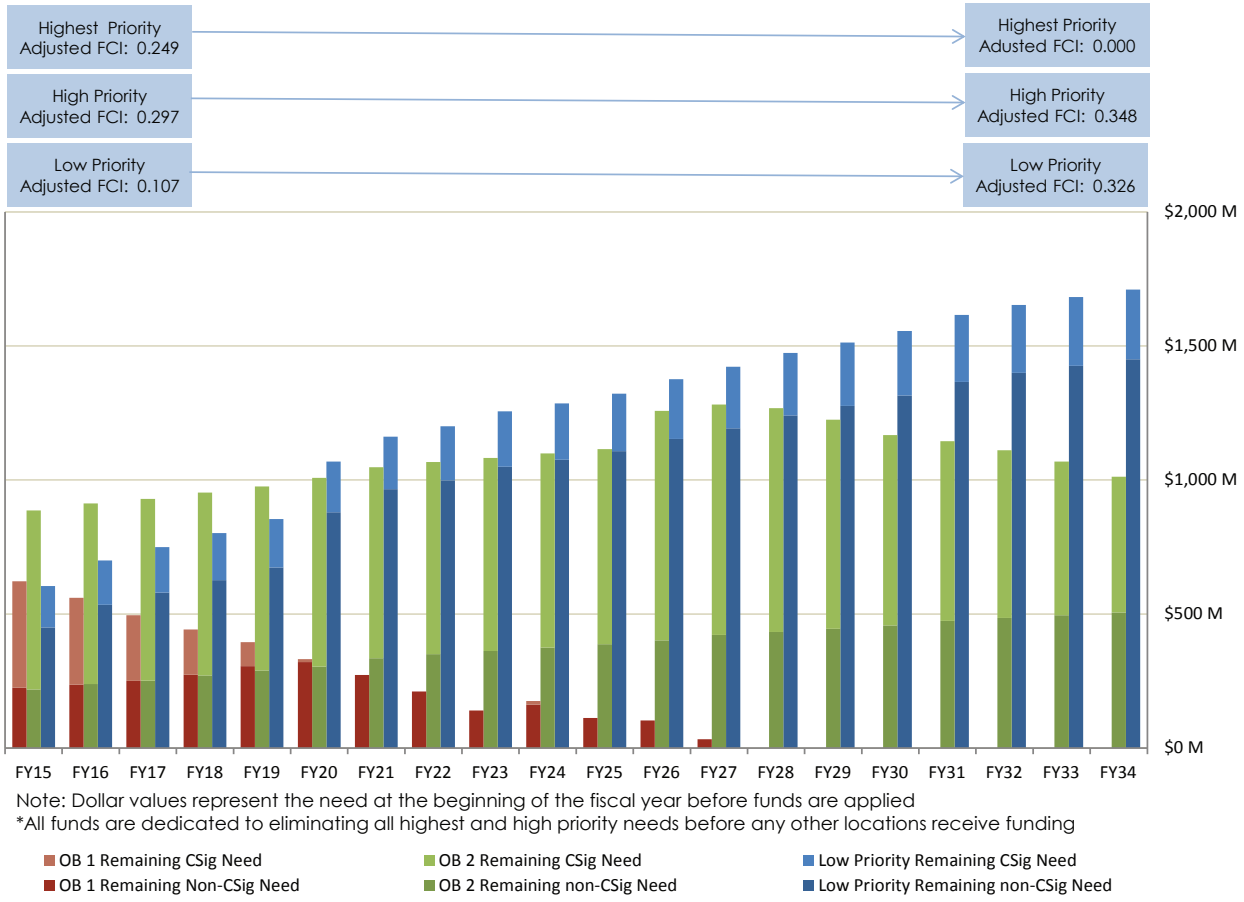
Advantages:

- Expands multimodal travel options by increasing funding for transit and other facilities well beyond historical levels.
- Retires the highest priority deferred maintenance for other facilities in only six years and reduces overall deferred maintenance for other facilities below current levels.
- Maintains conditions of highest and high priority roads comparable to the other strategies.

Disadvantages:

- Conditions of other priority roads will deteriorate.
- Reduces funding for bridges below that of other strategies (but to a level still higher than historical spending for bridges).

Figure 36. Deferred Maintenance Outcomes of Multimodal + CIS Strategy for Other Facilities.



Source: BAH DM Strategy Modelling

Results and Observations

A few observations below share some of the key lessons from the five funding strategies. **BY FOCUSING ON HIGHEST PRIORITY ASSETS FIRST, THE NATIONAL PARK SERVICE CAN IMPROVE CONDITION AND REDUCE DEFERRED MAINTENANCE** of these assets first while maintaining the same overall level of deferred maintenance as a less-structured strategy, such as the Business as Usual strategy. The Business as Usual + CIS strategy (and all the remaining CIS-related strategies) demonstrate positive outcomes related to prioritizing investments by asset priority.

BY INVESTING IN HIGHEST AND HIGH PRIORITY ROADS AT THE EXPENSE OF LOW PRIORITY ROADS, THE NATIONAL PARK SERVICE COULD TRADE OFF 1 POINT OF PCR FOR HIGHEST AND HIGH PRIORITY ROADS FOR 10 POINTS OF PCR FOR OTHER PRIORITY ROADS, assuming current PCRs as starting points. The Business as Usual + CIS strategy (and all the remaining CIS-related strategies) reflect a decision by the FLTP program managers to invest in highest and high priority roads at the expense of low priority roads.

THE NATIONAL PARK SERVICE MAY BE ABLE TO TRADE OFF 1 POINT OF PCR FOR HIGHEST AND HIGH PRIORITY ROADS AND A SMALL DECLINE IN BRIDGE CONDITION FOR MEETING ALL OPERATIONS AND PREVENTATIVE MAINTENANCE NEEDS. Operations and preventative maintenance can improve visitor experience, minimize deterioration of assets, and ultimately slow the growth of deferred maintenance. Additional modeling beyond this LRTP may be warranted, however, because the time horizons for roads and bridges (6-years) were different than for other facilities (20-years), and outcomes may vary for roads and bridges under this strategy beyond the 6-year mark. Additional modeling may help strike a balance between investing in operations and maintenance and addressing deferred maintenance in a sustainable manner.

THE NATIONAL PARK SERVICE MAY BE ABLE TO TRADE-OFF 1 POINT OF PCR FOR HIGHEST AND HIGH PRIORITY ROADS AND 10 POINTS OF PCR FOR OTHER PRIORITY ROADS TO BOOST SPENDING ON TRANSIT AND ALL BUT ELIMINATE DEFERRED MAINTENANCE FOR OTHER FACILITIES. More modeling using a common time-horizon and deferred maintenance projections for roads is needed to evaluate this further, but the Multimodal + CIS strategy potentially blends acceptable conditions for roads and bridges with sizable investments in multimodal assets.

STRATEGIES TO REDUCE DEFERRED MAINTENANCE AT THE EXPENSE OF OPERATIONS AND PREVENTATIVE MAINTENANCE MAY NEGATIVELY AFFECT VISITOR EXPERIENCE AND ACTUALLY ACCELERATE CONDITION DETERIORATION AND ACCRETION OF DEFERRED MAINTENANCE. The Address Deferred Maintenance + CIS strategy demonstrates accelerated reductions in deferred maintenance, but may actually accelerate accumulation of deferred maintenance as well.

EVEN THOUGH FUNDING FOR BRIDGES IS INCREASED BEYOND HISTORICAL SPENDING AMOUNTS, BRIDGE CONDITION IS EXPECTED TO DROP UNDER ALL FUNDING STRATEGIES. This is due to the aging of the bridge portfolio and the likelihood of accelerated bridge needs in the next several decades.

George Washington Memorial Parkway

Conclusions

The National Park Service is responsible for operating and maintaining a transportation system that protects America's spectacular natural and cultural resources while providing seamless, comfortable, and educational travel options for visitors. To do so with limited financial resources, the agency must target its investments wisely and make investment decisions that maximize the effectiveness of each dollar spent. The National Park Service is continually striving to improve its approach to transportation investments and, as this chapter highlights, there are many potential approaches to achieve this goal.

Each of the four alternative investment strategies presented have unique advantages and disadvantages; whichever path chosen will come with trade-offs. The impact of each strategy is diminished by the lack of resources—the amount of funding needed each year is expected to be more than three times what will be available. In addition to making strategic changes to its investment strategy, the National Park Service will also need to seek out new funding programs and partners to close the gap between available funding and needs.

Blue Ridge Parkway (c) Matt Blouir

Second Century of National Park Service Transportation

With this National LRTP, the National Park Service sets the standard for moving our transportation system forward into our second century. Designed to shape transportation investments servicewide over the next 20 years, the NPS National LRTP better aligns transportation planning with all aspects of the NPS mission and recommits us to both protecting and providing access to the nation's most important, unique, and special places. The National LRTP sets goals and objectives that address both traditional topics, such as facility management, financial sustainability, and safety, as well as additional mission-focused topics such as visitor experience, climate change, and natural and cultural resource protection. This approach is important because transportation systems by their very nature tie together the two halves of the NPS mission: 1) protecting resources for future generations, and 2) providing visitors with appropriate access to them.

Our work doesn't stop with the publication of this landmark document; the implementation of the plan has only just begun. The National Park Service is committed to continuing the broad coordination and collaboration across the agency, with the Federal Highway Administration, and with state, local, and agency partners that contributed to the National LRTP. We are riding that momentum forward and will take decisive action to achieve the plan's goals and performance targets. In the coming months, we will work across the agency and with our partners to form a national transportation action plan that puts the LRTP strategies into practice and establishes performance monitoring protocols. The National LRTP is for all of the National Park Service and as such, will require ongoing, active engagement and participation to implement it. The future of transportation in national parks depends on everyone's commitment, creativity, and enthusiasm for realizing the vision of a mission-focused transportation system that is safe and seamless, enables high-quality access to essential park experiences, and is effectively managed to accommodate changing environmental, social, and financial conditions.

In the second century of the National Park Service our transportation systems will increasingly connect people to the outdoors in diverse and engaging ways, supported by modern management systems and programs.

Implementing the NPS Capital Investment Strategy and improving our information systems for managing transportation facility conditions, needs, and expenditures will allow us to direct limited funding to the highest-priority facilities with the strongest connections to high-quality visitor experiences and essential park operations.

Working with our local partners and gateway communities will help us address vehicle congestion and expand the range of transportation options that make access to national parks more seamless, fun, and convenient.

Improving our tracking and management of culturally significant transportation facilities will help us preserve nationally significant, historic, and beautiful structures for generations to come while ensuring they meet modern safety standards.

Continuing and expanding our efforts to reduce greenhouse gas emissions will further establish the National Park Service as a climate leader and will help inspire our visitors to do their part at home.

Completing of the Safety Management System will allow us to better identify and address potential safety concerns on our public roads, including strategies to prevent wildlife/vehicle collisions.

Improving integration of natural resources protection in transportation decision-making will help ensure that we maintain an essential balance between visitor access and resource protection in new transportation projects.

Increasing our efforts to assess the vulnerability of our facilities to the impacts of climate change will make sure we have the information to make smart, forward-looking investments.

Please visit http://parkplanning.nps.gov/lrtp/ to stay engaged in the implementation process and to find detailed technical reports on many of the topics contained in the plan. This is also where you will find information in the coming years about updates to the National LRTP. Beginning with this first plan, we are committing to a continuing, cooperative, and comprehensive transportation planning process that will result in regular updates to reflect changing conditions and policies. The first update to the National LRTP is scheduled for 2019. We invite you to join us on this journey into a new century of stewardship, engagement, and enjoyment of America's national parks, burgeoned by a new holistic approach to NPS transportation.

Acronym List

3R	Resurfacing, Restoration, and Rehabilitation
AKR	Alaska Region
AIP	Asset Priority Index
ARRA	American Reinvestment and Recovery Act
ATPPL	Alternative Transportation in Parks and Public Lands
BHI	Bridge Health Index
BIP	Bridge Inspection Program
CCRP	NPS Climate Change Response Program
CFP	Climate Friendly Parks
CIS	Capital Investment Strategy
CLI	Cultural Landscape Inventory
CMAQ	Congestion Mitigation and Air Quality Program
CMS	Congestion Management System
CRV	Current Replacement Value
CSAP2	The Second NPS Comprehensive Survey of the American Public
DM	Deferred Maintenance
DOI	Department of the Interior
DOT	Department of Transportation
EMS	Emergency Medical Services
EPA	Environmental Protection Agency
FBMS	Financial and Business Management System
FCI	Facility Condition Index
FHWA	Federal Highway Administration
FLTP	Federal Lands Transportation Program
FMSS	Facility Management Software System
FRP	Federal Real Property
FTA	Federal Transit Administration
GHG	Greenhouse Gas
GIS	Geographic Information System
GPP	Green Parks Plan
GPS	Global Positioning System
HSIP	Highway Safety Improvement Program
IMARS	Incident Management and Reporting System
IMR	Intermountain Region

INSTEP	Innovative and Sustainable Transportation Evaluation Process and Guidance
ITS	Intelligent Transportation Systems
LCS	List of Classified Structures
LRTP	Long-Range Transportation Plan
MAP-21	Moving Ahead for Progress in the 21st Century Act
MWR	Midwest Region
NAAQS	National Ambient Air Quality Standards
NCR	National Capital Region
NER	Northeast Region
NHL	National Historic Landmark
NLRTP	National Long-Range Transportation Plan
NPS	National Park Service
NRL	National Register Listed
O&M	Operations and Maintenance
PAMP	Park Asset Management Plan
PCR	Pavement Condition Rating
PEPC	Planning, Environment, and Public Comment
PLH-D	Public Lands Highway Discretionary
PWR	Pacific West Region
QR CODE	Quick Response Code
RIP	Roadway Inventory Program
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users
SER	Southeast Region
SNPLMA	Southern Nevada Public Land Management Act
SOCC	NPS Sustainable Operations & Climate Change branch of the Park Facility Management Division
STARS	Servicewide Traffic Accident Reporting System database
TAR	Traffic Accident Reporter
TRIP	Transit in Parks Program
TSMS	Transportation Safety Management System
TSP	Transportation Safety Program
USDOT	United States Department of Transportation
USFWS	United States Fish and Wildlife Service

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As the nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historic places; and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

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